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EDITED BY

DR. E. M. WALKER,
Biological Department,
UNIVERSITY OF TORONTO, TORONTO.

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POPULAR AND PRACTICAL ENTOMOLOGY.

A WEEK'S COLLECTING ON COLISEUM MOUNTAIN, NORDEGG, ALTA.

BY F. C. WHITEHOUSE, RED DEER, ALTA.

A number of years ago Mr. F. H. Wolley Dod gave his experience of a day's collecting on a mountain top near Laggan (Ent. News, March, 1908). In the hope that it may prove of passing interest to collectors, I tell a somewhat similar story.

On the 16th July last year Mr. K. Bowman, of Edmonton, made a trip to the top of the Coliseum Mountain, Nordegg. He took a pair of *Brenthis astarte;* one or two *Papilio zolicaon* and *P. nitra;* took a *Neoarctia yarrowi*, and otherwise satisfied himself that it was a "happy hunting ground." On the 10th August, 1916, I made the same trip. The day was sunny but bitterly cold; however, I took a fine pair of *Neoarctia beani* and several other good things, and I was equally pleased with the promise of the Mount. Since then Mr. Bowman and myself have discussed a camping-collecting trip on Coliseum Mountain every time we met, and in the end we went.

We left Red Deer, 9th July, Alberta Central, 1.30 p.m. for Rocky Mountain House, arrived 7 p.m., spent the night at the Mountain View Hotel, and resumed our journey, C.N.R., 7 o'clock a.m., arriving at Nordegg shortly after noon. Mr. Stuart Kidd of the Bighorn Trading Co. had everything ready for an early start next morning, viz., two pack ponies and a packman, tent, sleeping-roll, blankets, a grub-stake, cook pots and an axe.

Mr. W. Stevenson, of Nordegg, a new recruit to the entomological fraternity, promised to join our party for two or three days; and the plan for the morrow was as follows: We to leave at 7 a.m. hot-foot for the mountain top to scout for water, and particularly a spring that I had found in August the previous year. It was estimated that we could perform our mission and be back at the cliff face in time to meet the packman and his ponies after

their laborious ascent. If water were found we could pack the stuff to the top, and if not, readjust our plans.

Well, we started at 8 o'clock and came upon *Brenthis triclaris*, beautifully fresh, just below the village. On the trail to Mire Creek, *Œneis jutta*, *O. chryxus*, *Colias interior*, *Pieris napi*, etc., were on the wing, and the muskeg teemed with *Phyciodes pratensis* in its infinite variety. Now I have no wish "to split on a friend," but Mr. Bowman, enthusiastic and capable collector as he is, is physically incapable of "carrying on" with anything required to perfect his series flying within a few feet of his net; while as to Mr. Stevenson, absolutely everything was to him pure gold! There were butterflies in the ointment, and the best laid plans came all to grief!

We reached the cliff face two hours late, with "Dutch" and his ponies scrambling up almost on our heels. Assuming that he would wait for our return, we hurried off to look for the spring. We did not find water, but *Œneis brucei*, *Colias nastes*, *Lycœna aquilo* et al., delighted our vision. While returning to the cliff face through a clump of spruce, Mr. Bowman took a sweep at a dragon-fly, and passed me his net containing a male of *Somatochlora minor*, and we shortly after took two females of *Somatochlora franklini* (to collect species of which genus was the particular object of the trip so far as I was concerned—though, of course, all desirable butterflies and moths were "good fishing"). From the spruce to where we were to find "Dutch" was not far, and we *found him*, scurrying home through the muskeg, 2,500 feet below, riding one pony and leading the other.

It was 1.30 p.m. We held a council of war.

Clearly "Dutch," tired of waiting for us, and probably quite as thirsty as we were, had dumped the pack and left us to our fate. Water we must have, unless we abandoned our camping scheme altogether—which we were naturally quite determined not to do —but first to find the pack. I suggested that the others go down to where "Dutch" was last seen, search there and scan the cliff face from below, for it was clearly unnecessary for us all to go down if it was to be only a matter of coming up again! They saw the pack right against the cliff about 200 feet east of me around a bend, and I made my way to it while they reclimbed the 500 feet.

Pending their arrival I rescued from a spider and appropriated to my own use a fine specimen of *Anarta cordigera*. Reassembled, we started the descent.

It was at this juncture that Mr. Stevenson discovered (by dropping the blanket pack) that cornerless objects will roll down hill. To confirm this, the tent, dunnage-bag and bedding-roll were despatched on a like course, after which the articles mentioned travelled by the "rolling method" exclusively—with occasional encouragement from the toe of a boot. Arriving at a plateau, it was decided that one of us should explore the bottom of the ravine for water. The others suggested that it was my turn, and I went. The descent was steep and a tangle of deadfall, but I reached the bottom at last. The rocks were dry! I struck off down stream, and within a few hundred feet came upon water—a spring, pure and cold, bubbling over the rocks for a hundred feet or so, and then again losing itself among the rocks. My friends joined me shortly after, and having drunk we decided that we would camp right there at about 5,000 feet. First, however, the outfit must be packed to the spot—terrible thought!

I will skip all that we endured from thirst and weariness for the balance of that semi-tropical afternoon. Let it suffice that we and our belongings were back at the camping ground again by 5 o'clock, and that in less than an hour we had the tent pitched and supper cooked. Here endeth the first day.

July 12th.—By 8.30 a.m. we had breakfasted and commenced the ascent, not on the slope taken the previous day, but that upon which the camp was situated. This proved to be the easier climb in every way—a matter of about an hour or so to the top.

It might be well here to describe briefly the Coliseum Mountain. It is a long mount of 6,500 feet altitude, running east and west, and consisting of three different formations. That to the east, is a long, smooth ridge, flat on top, and having two or three good clumps of spruce on the south side. The western formation is a round peak with perpendicular cliffs and a flat top. Joining the eastern ridge and the western peak, is a huge semicircular amphitheatre of loose shale, facing the south, from which the mountain takes its name. This is slightly lower, narrow on top, and treed with spruce. The highest point of the eastern

ridge is on the north side, nearly at the western end, and this is undoubtedly the best collecting area. The mountain side here is loose shale with a short cliff of four to six feet at the top.

Returning to the insects, on this, the second day, we found *Colias nastes* on the wing, *Œneis brucei* very common, *Argynnis meadi*, *lais* and *eurynome; Brenthis triclaris, chariclea* and *freija; Erebia epipsodea* and *disa* (the latter rare); *Lycæna aquilo* and *scudderi*, *Euchlöe creusa*, *Papilio zolicaon* (2 or 3 only and passé); *Pamphila mandan* and *Hesperia centaureæ*.

Of dragonflies I took *Cœnagrion angulatum*, *Æshna eremita* and *sitchensis; Sympetrum rubicundulum decisum*, *Leucorrhinia hudsonica* and, of the genus *Somatochlora*, males and females of *minor*, one female of an undetermined species, but no males to the odd females of *franklini* taken the previous day. We returned to camp well pleased with our catch.

July 13th.—On the top, mostly in the favoured area mentioned above, Mr. Bowman captured 6 of the handsome tiger moth, *Neoarctia yarrowi*. Our party explored to the western peak, and while the trip yielded nothing special, it was a glorious walk, giving a magnificent view of the Bighorn and more distant mountain ranges. On this date I took a male of *Somatochlora albicincta* on the top, and a female of the same on returning to the camp in the evening. This was the fourth variety of the genus in three days. Just before starting the descent in the late afternoon a new butterfly put in its appearance, viz., *Melitæa anicia*.

July 14th.—A glorious hot day, and by 2 o'clock Mr. Bowman had captured three *Brenthis astarte*. We also took four *P. zolicaon*, five *N. yarrowi*, eight *M. anicia*, two *Androloma maccullochi*, and other diurnals previously mentioned.

This was also a good day for dragonflies, as the males of *S. franklini* (quite fresh) put in their appearance. I took four; also males and females of *minor* and a male of *albicincta*.

In the early afternoon Mr. Stevenson, who had to return to Nordegg, bade us good-bye and left on his long tramp home.

July 15th.—Mr. Bowman accompanied me to the top and

caught a few good things, then at noon he also made tracks for Nordegg. Before leaving he explained the method that he had found most efficacious for taking that most difficult of butterflies—*Brenthis astarte*, viz., to wait patiently until the insect settled on one of several pink-flowered plants of *Dianthus acaulis* and then spring! In due course a bright male appeared, and for half an hour I tried Mr. Bowman's method—and every other—in vain. *Astarte* is a peculiar insect—deceptive as to colour, pugnacious as to disposition, and fleet passing understanding. On the wing it looks *red*, due to the rapidly beating wings exposing the undersides. Why it should rush at every inoffensive butterfly that comes near it I cannot say, but rush at them it does. *Astarte* makes its appearance from the shaly slopes and, flying up over the edge of the cliff, rushes round on top for a few minutes attacking every butterfly in its course. Then it tumbles headlong over the cliff, flies along the loose shale, comes up again—and repeats. I watched my first *astarte* do all this many times and inspiration came to me. It flew *slower* when it was over the cliff! Why? Ah, I had the secret, and over the cliff I went myself (almost headlong in my eagerness). There I sat, where the foot of the cliff rose from the shale, net ready, and my eye glued to the edge of the cliff to my right where he would come over. Here he is! Flew right into my net! I give my discovery for the benefit of future collectors of *astarte*. Down under the cliff, both "hunter and hunted" are in the shadow.

At 3 o'clock as nothing much desirable excepting *Colias nastes* seemed to be on the wing, I was inclined to return to camp, but decided that I would first try the second clump of spruce. Well was I rewarded, for there I took a fine, fresh *Erebia disa*—my first of this species—and a pair of *Melitæa anicia* and, returning through the other clump, I captured a dragonfly prize indeed, a beautiful female of *Somatochlora cingulata*—the fifth species of the genus to date! I also took a number of two other varieties, *franklini* and *minor*, and one female of *walshii*.

I returned to camp at 5.30, and amplified tent accommodation was the only compensation that I had for the loss of my two friends.

July 16th.—This day I took a good mixed bag, increasing my Somatochlora series of *minor*, *albicincta* and *franklini*. Two *astarte* were on the wing, a female that I took at rest on a rock, and a male by the easy system practiced the previous day. I also caught one *N. yarrowi*, a fine pair of *Vanessa milberti*, a *S. galii*, two *C. nastes*, two *Œneis chryxus* and saw a *Neoarctia beani*, that I much wanted for Mr. Bowman, flying low over the shale. I walked to the eastern end of the ridge, but a strong south wind was blowing and nothing much resulted.

Mentioning wind, reminds me that a breeze on a mountain top—even on glorious, hot, cloudless days, is the rule rather than the exception, This has evidently created in mountain-top butterflies the protective and pretty habit of lying over on their sides when at rest. *C. nastes* and *O. brucei* are much given to this attitude, but I think all the other species taken adopted it more or less. Even when temporarily there was no wind, or the spot was a sheltered one, it made no difference. Instinct told them to "lie low," and lie low they did.

On returning to camp I saw a largish Somatochlora flying by a jack pine, and netted it successfully when it settled. It proved to be a male, not of the odd female of the 14th (*cingulata*) but a seventh species, viz., *semicircularis*.

July 17th.—This was to be my last day on the mountain, Some time during the morning, i. e., after I had left for the top. "Dutch" was to come up to pack the outfit back to Nordegg. I rose at 6.30 and reached the top at 10 o'clock. Soon after I saw, but failed to capture, a butterfly that I greatly desired, viz., *Papilio nitra*. It flew straight past me just out of reach. I did get, however, a male Somatochlora to pair with the large, white-ringed female of the 15th, *cingulata;* a lot of females of *S. franklini*, and a mixed lot of butterflies that have already been mentioned. At 2.45 I started down for Nordegg, took several fresh *Colias christina* and a *Pieris occidentalis* en route, and arrived at 4.30.

While my story of the mountain is finished, I might record a few captures made during the next two days in the valley. On

the 18th I took a male of the very rare dragonfly *Somatochlora septentrionalis*, and on 19th three males of *Somatochlora hudsonica* —making nine species of the genus in nine days. This is believed to be the world's record. On the 19th, with Mr. Bowman's assistance, I also took 60 *Cœnagrion interrogatum*, of which dragonfly but eight specimens had previously been taken, a long series of *Somatochlora albicincta* and a fine *Euchlöe ausonides*.

Mr. Bowman, on the nights of 15th and 16th worked "light" for months, and he and I collected at night together 17th, 18th and 19th. Of the mass of material taken I will mention a few. Six *Neoarctia beani*. This was somewhat of a surprise as we believed the insect a mountain-top species. Of the genus Autographa, the following: 1 *mappa*, 1 *putnami*, 1 *excelsa*, 2 *flagellum*, 4 *orophila*, 13 *Euxoa mollis*, 10 *Phasiane ponderosa*, 2 *Hydriomena perfracta*, etc. At Nordegg also in May last Mr. Bowman took a fine series of *Spodolepis substriataria*.

But few varieties of birds were noted on the mountain, viz.: eagles (both the golden and bald-headed occur there); a finch, I think *Spinus pinus*, and the large grouse *Dendragapus obscurus*. In the valley on 19th July Mr. Bowman and myself had a good opportunity to observe an Arctic three-toed woodpecker, *Picoides arcticus*.

Mammals were very little in evidence on the mountain. I saw what looked like a rather large chipmunk on the loose shale where *astarte* dwells, one squirrel at the camp, and some deer tracks near the top. I also heard a mountain marmot—the whistle of which is unmistakable. Of course, bears, both grizzly and black; bighorn sheep and goats all occur near Nordegg, but Coliseum would hardly be high enough for sheep or goats, and I certainly saw no signs of bear.

Nordegg, as an entomological collecting ground, is rich and virgin soil, and systematic work there for several years should produce fine results. While the town is really a coal mining camp, any collector would be made welcome, and Mr. Stuart Kidd, of the Bighorn Trading Company, would, I am sure, arrange camping facilities to meet any collector's requirements.

NOTES ON BARNES AND McDUNNOUGH'S "*CHECK LIST OF LEPIDOPTERA OF BOREAL AMERICA*."

BY F. H. WOLLEY DOD. (ON ACTIVE SERVICE.)

The authors of the new Check List have followed Sir George Hampson's arrangement of families and genera, making certain changes which for various reasons seemed advisable. They have discarded certain of Hampson's generic names, considering that compliance with Banks and Caudell's "Entomological Code" was more likely to meet with general acceptance than the law of strict priority, which has been most rigidly adhered to by Hampson. With that exception, the changes made in generic reference and in specific synonymy are based on careful study of structural characters and positive identification of species. For many years the authors have been making a most careful and systematic study of types, and of figures and descriptions as well. With the enormous amount of material at their disposal they have been able to compare and match types exactly, and have accurate figures made of others, and by studying long series from various parts of the continent, have been able to trace associations which Hampson, with fewer specimens available, had no opportunity of doing. Whereas in Hampson's work the arrangement of the species in each genus is in tabular form, based (1) on secondary sexual characters, and (2) on certain details of colour or maculation, in the new list the species are, to a great extent, grouped together according to their degree of apparent relationship to one another, a more scientific method from the writer's point of view, though one presenting considerable difficulty in accomplishment, owing to the diversity of relationship of many species to others in different groups. Thus the position of a species in a large genus in the new list, whilst in general denoting affinity to those placed near it, does not necessarily signify nearer relationship to them than to others placed apart from it.

The careful and painstaking methods of Messrs. Barnes and McDunnough have been well known to the writer for years, and, as regards the Noctuinæ, he has most carefully followed their published notes, and not infrequently exchanged correspondence and ideas with them, which has resulted, it is to be hoped, in mutual

benefit. The writer has made a special study of specific characters in the Noctuinæ, but must admit the undoubted advantage which the authors have over him in the amount of material examined. By far the greater number of changes in synonymy in this family made by them are much in accordance with his own views, but it is perhaps inevitable that he is unable to concur fully with their opinion on all points of relationship or identification, though in some instances he must submit to their superior knowledge. Some of the divergences of view are doubtless the result of differences of conception as to the term "race." On the whole, the authors have, perhaps, erred on the side of conservatism, and usually have been inclined to give a doubtful form or race the full benefit of the doubt in placing it as a species. It may be that the writer has grown unconsciously to err in the other direction.

Notwithstanding a complete index, collectors who have not studied Hampson's works may, at first, experience some difficulty in finding their way about the list. But too full a synonymy in a mere check-list, which is all that it purports to be, is apt to be confusing rather than otherwise. The majority of the points in which the list differs from Hampson have been referred to in various publications, but principally by the authors in their "Contributions." A few changes, however, appear for the first time.

The following notes and criticisms include those that are confirmatory, controversial, and contradictory. Some of the points referred to have previously been published by the writer in sundry papers, and no excuse is offered for repetition. Those of a contradictory nature are in no wise intended to be derogatory to the value of the list, or to the knowledge of its authors, but rather, it is hoped, to enhance its value, and offer suggestions for future investigation.

Arctia obliterata Stretch. stands as an aberration of *ornata* Pack. (978). If that is correct, the identification, as Stretch's species, by Dr. Dyar, of a Calgary specimen in my collection, which is almost certainly a form of *turbans*, must be wrong.

Euxoa collocata Sm. stands as a synonym of *atristrigata* Smith. This reference is new to me, though I had tentatively as-

sociated them from a figure of the latter which was described in 1890 from a single poor and badly-rubbed specimen from "N. W. B. C." I did not recognize it when I saw the type, which must be a very pale specimen. I had not previously heard of *collocata* from Canada.

E. rubefactalis Grt. is made a synonym of *infracta* Morr., which is also new. The latter is known to me only by the description, which is meagre, but does not misfit.

E. relaxa Sm. It is a surprise to see this referred to *septentrionalis* Walk. I knew the latter well by sight when I saw the type of *relaxa* in 1910, and pointed out several specimens of what I believed to be Smith's species to Dr. Barnes about a week later, amongst a lot of unstudied material which he handed me to look through. I never for one moment associated it with Walker's species, and am under the impression that it is still absent from my own collection. I am not willing to accept the reference at present.

E. declarata Walk., with *decolor* Morr. as a synonym, is kept distinct from *campestris* Grt. Walker's type is a rather large male from Vancouver Island. Grote's is a rather smaller and narrower-winged female from New York. Both are even, dull fuscous brown. It would be hard to find two specimens more alike in colour, and all the details of maculation are exactly similar also, and, as I have before stated, I consider them identical. Morrison's type I never saw. Smith stated that it was a form with contrasting light and dark shades. The original description is not very lucid, but seems to indicate something of the kind, especially as it begins, "allied to *geniculata*."

E. tessellata Harris. The synonyms and varieties placed under this name are, as a whole, much as I had them in my own notes, though it is not clear why five of Smith's names stand as synonyms of var. *tesselloides*. Judging from a number of figures by the authors as *orbicularis* Smith, I should include that without question. But this name stands as a species separated from the present one in the list by over sixty others,

and associated closely with *mœrens* and *sotnia*, which have little in common with *tessellata*.

E. olivia Morr., hitherto unrecognized in our lists under *Feltia*, the authors have apparently examined, and consider it to be prior to *lacunosa*. Morrison's species is still unknown to me, and I have several times changed my opinion about the type of *lacunosa* in the British Museum. But the other six names here referred to as synonyms or varieties, are in my opinion all one species, and the same as the *lacunosa* of the Henry Edwards collection.

E. criddlei Sm., is made a variety of *exculta* Sm. That is new to me. I knew them to be close allies, and do not dispute the reference, but I must refer *criddlei* to *perpolita* Morr., though I little suspected it on first acquaintance with *criddlei*, and before I saw the black form.

E. sessile, *termessa* and *nœvula* are treated as one, as I had suggested in correspondence that they should be, but their reference to *alko* Strk. is new to me.

E. friabilis Grt. stands as an aberration of *messoria*, which I believe to be correct. Dr. McDunnough and I studied the type together, and arrived at the same conclusion. It came from Ontario.

E. vallus Sm. I had not previously associated this closely with *hostoniensis*, but am interested to note the suggested near relationship.

E. vulpina Sm. I think this should certainly be nearer *quinquelinea*.

E. nesilens Sm., is correctly referred as a form of *tristicula*, but I have referred the former name as a synonym of *remota* Sm. Two female types of *remota* in the Henry Edwards' collection were exactly like Calgary *nesilens*, and a type in the Washington collection, while differing in certain details, agreed with a Calgary *nesilens* in Dr. Barnes' collection. The author places *remota* next *tessellata*, separated from *nesilens* by nearly forty species.

Chorizagrotis auxiliaris, soror, agrestis and *inconcinna* stand as four species, with *intraferens* as a form of the first named. The latter is correct, but *agrestis* and *auxiliaris* are also the same species as I have proved by breeding from a known parent. Nor am I able to recognize *soror* Smith as distinct. The species appeared in millions in Southern Alberta in the spring of 1915, the larvæ doing widespread damage to field crops. I have little faith in the distinctness of *inconcinna*, but must let that stand for the present.

Rhizagrotis insertans Sm. Another of those species, described in 1890 from B. C., of which I had seen the type, but failed to recognize it. The authors place it between *albalis* and *cloanthoides*.

Agrotis acarnea Sm. The species, besides having spined tibia, has slightly hairy eyes, which fact I pointed out to Smith in 1910, though he failed to see it. A few other specimens have since come to hand, and one is in the British Museum. Hampson has described a new genus, *Trichosilia*, to receive it. It is is related closely to *Episilia*.

A. inopinatus, sierræ and *unimacula* stand, in this order, as three species. The latter name is used by Hampson as prior to the long familiar *haruspica*. I have quite failed to separate *inapinatus* from *unimacula*. *Sierræ* is doubtful, but is scarcely well placed between the other two names.

A. atricincta Sm., is referred to *tepperi* Sm. This is quite new to me. I have not seen the type of the latter, but assume the reference to be correct.

Aplectoides fales Sm. I cannot consider this distinct from *pressus* Grt. as listed. It is not unlikely that more of Smith's names in this genus will have ultimately to be referred to Grote's species.

Ufeus Grt. I have referred *hulstii* Sm. described from Utah, to *plicatus* Grt. In the new list they stand as distinct. I have carefully compared Grote's description with the Grote specimen (not the type) in the British Museum. This leaves me

in doubt as to whether my previous identification of *plicatus* —made on unsound evidence—was correct, and for the present I provisionally accept *hulstii* as distinct. It occurs in Canada, and stands in most collections as *plicatus*.

Anytus Grt. The species previously referred to *Fishea* Grt., as well as to *Anytus*, are included under this generic name. *Hanhami* Smith, described from Vancouver Island, stands as a var. of *evelina* French. *Discors* Grote, identified by Smith as a *Luperina* near *burgessi*, is now referred to this genus, with *vinela* Smith as a synonym.

Next comes *cupola*, a species described by Hampson from specimens sent him by the writer from Utah. Then follow, in this order, *yosemitæ* Grt., *enthea* Grt., *instruta* Sm., (syn. *derelicta* Hamp.), *exhilarata* Sm. and *betsia* Sm. *Exhilarata* I have referred elsewhere to *yosemitæ*, and Smith(in litt.) concurred. It is not clear why they are here separated by the other names. *Derelicta*, from Aweme, seems correctly referred to *instruta* from De Claire, both Manitoba localities. This species is *yosemitæ* of previous lists, though this reference is not given. It is unquestionably very close to *enthea*, and may prove to be a pale form of it. *Betsia*, which I have from the type locality in Utah, is very likely a pale form of either *yosemitæ* or *instruta*, which are very close allies.

Matuta Grt. (*Adelphagrotis* Sm.) *Apposita* should not stand between *stellaris* and *quarta*, which are more nearly related to one another than *apposita* is to either.

Rhynchagrotis Sm. Not much revision of the list of these species has been attempted by the authors. The genus is, if possible, a more difficult one than *Euxoa*, and until many of them have been bred, it is perhaps as well to leave the names about as they stand.

Scotogramma Sm. *Trifolii* is referred here, as per Hampson. *Mutata*, described by me under *Mamestra* as an ally of *trifolii*, also stands under this genus. Hampson has placed it in the collection under *Cardepia* as an ally of *nova* Smith. I accept his generic reference, though superficially the resemblance is

nearer *trifolii*. *Oregonica* stands as a species, with *morana* Smith as a variety, and I believe that to be correct. *Inconcinna* Sm. stands next, and is most certainly well placed.

Polia Ochs. Following Hampson, this generic name is used for *Mamestra* of previous lists. Hampson, however, has found *Miselia* Ochs. to be a prior name. *Distincta* Hbn. is a difficult species to place in a list, as it seems to have no very close ally, but it surely has no justifiable position between *determinata* and *columbia*. Also the relationship suggested by seeing *leucogramma* between *columbia* and *meditata* is new to me. I believe *columbia* to be a local form of *meditata*, and have expected that *determinata* may prove to be the same species.

P. ingravis is very likely the same as *quadrata*, though they are here separated by twenty-two species.

P. lubens is referred to *cristifera* by Hampson, but now they are correctly separated. *Invalida*, which stands as distinct, I believe to be *cristifera*. The two Vancouver Island specimens of *glaucopis* Hamp., on which the description was based, looked at first rather sharply distinct from the poor series of *lubens* in the British Museum, but after seeing more material, I agree with the authors in considering it only a variety.

P. mystica Smith (1699) should most certainly come next to *nimbosa* (1696).

P. dodi (1716). The correct place for this seems between *tacoma* (1709) and *lilacina* (1717); and *liquida* (1707), of which I consider *meodana* (1708) merely a variation, belongs to the same group. I should prefer to see *atlantica* (1710) between *subjuncta* (1686) and *nevada* (1687), and indeed in Western Canada it may sometimes be confused with the latter. A Calgary male in the British Museum bearing Barnes' and McDunnough's label "*nevada*" is a dark, richly coloured *atlantica*.

P. detracta (1659) would closely associate with *goodelli* (1718), and *acutermina* (1719) is very doubtfully distinct from the latter.

P. pulverulenta Smith. If my identification of this is correct, it is unquestionably distinct from *assimilis*, though it still stands as a variety, as described by Smith, and subsequently listed by him and all other authors. Both occur in Alberta, and not only are they separable superficially, but the male genitalia differ obviously. This happens to be at variance with Prof. Smith's own statement, and it is not unreasonable to suspect some inaccuracy on his part. I must admit I have not seen the type, but my identification fits the description exactly, except as to genitalia.

P. larissa (1739). I cannot consider this to be distinct from *anguina* (1732). The type of the latter is in the British Museum, and a comparison with seven Calgary *larissa* there shows them, to my mind, to be identical. *Imbuna, vicina, acutipennis* and *pensilis* stands as four species. They comprise a rather puzzling aggregate which requires thorough investigating with the aid of breeding and genitalic study. There seems little to separate *imbuna* from *vicina* except size, and that difference is well within the reach of variation. *Acutipennis* seemed satisfactorily referred to *vicina* also, where Hampson left it. I still try to keep *pensilis* separate in my collection, though I have much difficulty in placing material from some localities.

P. negussa (1682), whilst correctly in close association with *plicatus* (1681), stands widely separated from *gussata* (1742) in the new list. In so far as it is possible to be sure without having bred them, I am convinced that the first and last named are forms of one species. Mr. Tams worked specially for them in the spring of 1915, and procured a fine series, whilst Mr. Sanson took a number at Banff in the same year. The variation is continuous between the two extremes. I refer both names to *segregata* (1741).

P. beani (1743). The nearest ally of this is surely *legitima* (1741).

P. tenisca Sm. stands as a variety of *stricta*, and, contrary to my original belief, I consider this correct.

P. olivacea Morr. The ten names standing as varieties of *olivacea* are scarcely all of varietal value, but one of them, *comis*, may possibly prove distinct, in which case *petita* is probably a variety of it. Breeding from Vancouver Island females may throw some light on the problem.

P. hanhami B. & McD., and *alfkeni* Grt. are both now referred by Hampson in the collection to *Eriopyga*, where they seem to fit better. His error in placing Grote's species with the Acronyctinæ in the catalogue has been elsewhere referred to.

Eriopyza Gn. I have referred *smithi* Dyar (1861) to *incincta* Morr. (1819), but am open to conviction to the contrary if good evidence is forthcoming. *Uniformis* stands as distinct from *furfurata* with very doubtful correctness.

Nephelodes Gn. I cannot agree to the separation of *tertialis* from *emmedonia*. The latter name Hampson has found to be prior to *minians*.

Xylomiges Gn. I am glad to see *indurata*, *nicalis*, *tantiva* and *argus* all referred to *curialis*, as that is fully in accord with my own views formed after seeing the types; but that the names are all of varietal value is hard to believe.

Orthosia Ochs. This is used by the authors instead of *Monima* Hbn. of Hampson, and includes the large species under *Graphiphora* in Dyar's list. The treatment of a very large number of Smith's names throughout the Noctuidæ,would probably have caused him deep concern had he been spared to see it, but the retention of so many as referring to varieties might have given him some solace. Under the latter category, with doubtful justice in every case, come his seven names under *hibisci*. If they can really all be retained, I feel that my *latirena* referred to too large an aggregate, and is not sufficiently definite to be retained as well.

(To be continued.)

GEOMETRID NOTES.

On the Genus Xanthorhöe.

BY L. W. SWETT, LEXINGTON, MASS.

Xanthorhöe pontiaria and *forsaria* Taylor have been so often misidentified in collections, that I have tried to straighten them out in this paper. About three years ago Mr. E. H. Blackmore, of Victoria, B. C., collected a long series of all the forms and sent them to me to work up. Through the kindness of Drs. Barnes and McDunnough I was supplied with types and paratypes of both species, so that I did not have to rely on descriptions.

Xanthorhöe pontiaria was described by the Rev. G. W. Taylor in the Canadian Entomologist, vol. XXXVIII, p. 400, Dec. 1906, from four specimens, the type being a female from Wellington, B.C., May 23, 1905. There were two other females agreeing with the type, and from the same locality, but the male from Salem, Oregon, June 2, 1904, on a closer examination, proved to be distinct and a good species. The typical *pontiaria* Taylor is whitish fuscous in colour and resembles slightly the European *fluctuata*, but is much larger. The central band of the primaries is usually brownish, with a whitish centre, in the type form. The anal tuft of hairs of *pontiaria* is bushy and reddish-shaded, and seems broader than in any of the other species. The head is reddish-tinged in front, and the antennæ appear to have longer pectinations than the other species. There is a form of *pontiaria* in which the central band is solid reddish brown, but this is not so common as the white-centred variation. The male type of *pontiaria*, as I have said before, is not conspecific with the female; and as the female was designated as the type, I propose to describe the male as follows:

Xanthorhöe macdunnoughi, sp. nov.

Antennæ rather narrowly pectinate, palpi short; front of head gray, as is thorax and abdomen. The primaries are dark ashen gray, with a broad, irregular fuscous band centrally. Basally there are several indeterminate hair-lines, rounded outwardly below the costa. Just before the intradiscal line there is pale band crossed by a geminate, brown hair-line, following the same course as the intradiscal line. The intradiscal line is geminate, bent

sharply outwardly below costa, then running in scollops on the veins to inner margin. Beyond the intradiscal line is a brown hair-line scolloped outwardly on the veins and bordering the pale, central portion of the median band. Just before the extradiscal, is another hair-line, following the same course and scolloped on the veins. The central part of the band is lighter with a small, black discal spot. The two central hair-lines have a tendency to form confluent circles in the median band of the primaries. The extradiscal line is geminate, composed of two hair-lines bent outwardly below the costa, forming a projection, then making an inward and outward curve to form a second projection. From the second projection it curves slightly backward, then runs straight to inner margin. The pale space beyond the extradiscal line is crossed through the centre by a scolloped hair-line. A submarginal brown scolloped line, the scollops running inwardly on the veins. The margin is fuscous traversed by a white, subterminal scolloped line. The fringe is short, fuscous, with small, geminate, black dots at the base. Secondaries pale gray with six or seven indeterminate, brown, wavy, hair-lines crossing them. The basal line runs just outside of the discal spot, curving upwards slightly as it leaves inner margin. The next two lines follow the same course as the extradiscal, and beyond this is a pale band, with a hair-line running through the middle. Margin of wing fuscous with a white, scolloped, subterminal line. Beneath the primaries are smoky ashen, with the lines above showing faintly through. Secondaries marked the same as above, only the lines are, in most cases, accentuated as dots on the veins.

This is a rather rare species, and not so ashen in colour as *pontiaria*, being more of a gray fuscous colour. I take pleasure in naming this species after Dr. McDunnough, who has given us many valuable papers in the "Contributions," despite several adverse criticisms which have recently appeared.

Expanse 25–30 mm.

Holotype.—♂, May 30, 1915, Victoria, B.C., from E.H.Blackmore, in my collection.

Allotype.—♀, May 14, 1913,Victoria, B.C., from E. H. Blackmore, in his collection.

Paratypes.—3 ♂s and 2 ♀s from Victoria and Duncans, B. C., in my collection; 4 ♂s, 7 ♀s, June 7 to July 3, from Victoria and Goldstream, B.C., in the collection of Mr. Blackmore. One ♂ Salem, Oregon, June 2, 1904, with other ♂s and ♀s from British Columbia in the Barnes' collection.

Xanthorhöe macdunnoughi can be easily separated from *pontiaria* Taylor by the general gray colour of the primaries, the gray head (that of the latter being reddish) and the narrower pectinated antennæ.

Xanthorhöe forsaria Taylor (Can. Ent., l. c., p. 401) has been a puzzle for a long time. It is evidently a species of high altitudes, as I have never seen any except from mountainous regions. The specimen from Laggan, Alberta, July 20, 1904, may not be the same as *forsaria*, as I have a ♀ from the same district which seems distinct. The type specimen taken in August is a yellowish ashen with a faint, reddish brown median band, the whole insect having a rubbed appearance. I have seen two other specimens taken on Mt. Cheam, B.C., by Mr. Bush through Mr. E. H. Blackmore, and they agree with Drs. Barnes' and McDunnough's specimens. The central band is narrow at the inner margin, and has the projections of the extradiscal line well rounded off. I have a form approaching *forsaria* Taylor very closely from Atlin, B.C., which I propose to describe as follows:

Xanthorhöe atlinensis, sp. nov.

Head, thorax and abdomen fuscous; antennæ rather narrow as in *macdunnoughi*. Primaries smoky fuscous, rather diaphanous, crossed by seven or eight scolloped fuscous lines, with a faint, reddish brown median band. There is a basal brown patch, the outer edge of which runs out from costa toward median vein, then bends backward and goes to inner margin. There are three brown scolloped hair-lines between basal and intradiscal lines. The intradiscal line curves slightly outward till just below costa, then runs straight to inner margin, with a slight curve, being accentuated on the veins. There is a second hair-line running exactly like the intradiscal and almost touching it. The centre of the median band is lighter than the sides, and has a small, black spot. There is a hair-line just before the extradiscal which makes

quite a sharp projection below costa, then curves back and runs straight to inner margin. The extradiscal line goes straight across costa, the forms the usual sinus, the projections of which are rather more rounded than usual. Below the second projection the extradiscal line runs back, then goes straight to the inner margin, being rather narrow there. The median band has a reddish brown, somewhat washed-out appearance, as in *forsaria*, and is narrow at the inner margin. Beyond the extradiscal line is the usual pale band, with two scolloped hair-lines; and a fuscous outer margin, with subterminal, scolloped, white line. The fringe is short and fuscous, with the small, marginal dots rather contiguous. Secondaries pale smoky fuscous with six or seven indeterminate scolloped hair-lines, accentuated as dots on the veins. The extradiscal line runs straight out from costa, making a rounded angle below the small, black, discal joint. There is a pale band which is crossed by a scolloped line, then a heavy scolloped submarginal line, followed by a fuscous marginal border with the usual subterminal, scolloped, white hair-line.

Beneath the primaries are as above with the lines faintly showing through, but the basal portion is darker than the outer portion. Secondaries as above, but are darker basally.

This species is closer to *forsaria* Taylor than any other, but differs in the smoky diaphanous colour where the former has a yellow or ochreous tinge. It also differs in the time of appearance. These species all have the lines and bands running about the same, and it is very difficult to draw any one character as constant.

Expanse 30 mm.

Holotype.—♂, June 26, 1914, Atlin, B.C., from Mr. E. H. Blackmore, in my collection.

Paratypes.—One ♂, June 28, 1914, from Mr. Blackmore, in my collection, and 6 ♂'s, June 28, 1914, in coll. Blackmore and the Provincial Museum, Victoria, B.C. There is still another species occurring in the vicinity of Victoria, B.C., which emerges early in the season and resembles superficially *pontiaria* but is more fuscous, and the central band is solid blackish with a tendency to fade below median vein, as in *forsaria* and *atlinensis*. This species was taken along with the others by Mr. Blackmore, and

as it is through his efforts that I have been able to prepare this paper I propose to describe it as follows:

Xanthörhoe blackmorei, sp. nov.

Antennæ broad as in *pontiaria*, front of head with reddish tinge, thorax and abdomen fuscous ashen. The primaries are fuscous ashen, a basal brown band starts at an angle from the costa, turns back and goes straight to inner margin. There is a pale space crossed by three scolloped hair-lines beyond the brown basal patch. The intradiscal line starts at an angle below costa, then curves outwardly to inner margin. In the holotype, the intradiscal line curves outward from costa to inner margin and lacks the sharp bend downward on costa which occurs in some specimens. The median band is usually solid blackish with a wine-coloured tinge, and has a tendency to disappear below median vein. In some examples the centre of the median band is pale and there are the geminate intra- and extradiscal lines, as in the other species. The extradiscal line runs downward from costa about 3 mm. and then forms a small sinus, the second projection of which is about on a line with median vein. Below the median vein the extradiscal line makes two scollops inwards, then runs straight to inner margin, scolloped on the veins. There is the usual pale, extradiscal band and scolloped hair-lines with the marginal band beyond and subterminal, white scolloped line. The fringe is short with small, black dots on either side. The secondaries are fuscous ashen, with the usual lines, except that in some specimens the extradiscal line is strongly angled below the discal dot. Beneath the primaries and secondaries are marked as above but paler, except in the basal portions, where they are smoky.

Expanse 28–30 mm.

The early date of appearance, together with tendency of the extradiscal line to be angulate, and the blackish median band of primaries, help to separate this species from the others.

Holotype.—♂, May 2, 1915, Victoria, B.C., from E. H. Blackmore, in coll. Swett.

Allotype.—♀, May 19, 1915, Victoria, B.C., from E. H. Blackmore, in coll. Swett.

Paratypes.—♂s and ♀s, from Victoria and Goldstream, B.C., in colls. Blackmore, Barnes and Swett.

These closely allied species are best separated by the genitalia, as the markings run very close and they are rather variable.

Xanthorhöe pontiaria differs from the others in the shape of the costa of the valvæ, near the tip, which is somewhat sickle shaped and has heavy, tooth-like spines resembling a lobster claw. The sacculus is long and jointed, the saccus does not taper but is broad and rounded at base. The penis is stout with a spined, bulbous head, the spines being long and heavy. The calcar is not heavily haired.

Xanthorhöe macdunnoughi has a very short, chunky costa, with deep sinus near the tip, which is heavily armed with fine spines, extending around tip almost to the indentation on the sacculus. The sacculus is not elongated as in *pontiaria* and has the indentation opposite projection of costa above, and is very broad and somewhat angulate near the base. Penis stout with bulbous spined head; calcar with fine, short hairs. The saccus is not blunt but rather long and tapering. The shape of the saccus alone would separate these two species.

In *Xanthorhöe blackmorei* and the two species following, the costa of the valvæ is of a very different shape. About half way between the tip and base there arises a jointed projection like the horn of a rhinoceros, with the point directed just above base of uncus. On the outer side it slopes down forming a sinus, the extreme tip of costa being club shaped and with a few fine spines. The sacculus is elongated, rounded at tip, and has very slight indentation opposite base of projection. Near the base it forms quite a sharp angle. The calcar is longer haired than the former species and rather coarse. The saccus is broad and blunt like *pontiaria* at tip.

Xanthorhöe atlinensis shows a close relationship to *blackmorei* in the shape of the costa of the valvæ but differs as follows: The projecting horn is a little nearer base and just before it there arises a second little horn. The horn is more erect than in *blackmorei* and on the outer side slopes down, forming a gentle elongated sinus, the tip of it being just rounded, not swollen or club shaped. The sacculus is elongated and pointed at tip, and opposite the

horn has an oblong indentation, and the base lacks angulation. The saccus is broad but has a suddenly narrowed tip; the calcar has rather long hairs, but they are rather sparse. The penis is stout and bulbous with spines, and the cornuti of the vesica are three in number, long, moderate and short.

In *Xanthorhöe forsaria* the costa of the valvæ is shaped as in *atlinensis*, but the first horn is much longer, as is also the large one. On the outer side of the large horn is a slight point or rudimentary spine. The large horn is nearer tip of costa than in *atlinensis*, also it makes a very slight sinus, and the tip is quite narrow with many fine spines. The sacculus is elongate and pointed but broader than usual, and the base is very wide and rounded. The calcar has numerous fine, short hairs, and the saccus is broad with a stubby, rounded tip, not narrow as *atlinensis*. The penis does not seem quite so bulbous or so stout as usual, though it is decorated with the usual heavy spines. Probably all the species have the three cornuti on the vesica. My mount of *Xanthorhöe forsaria* was made from a ♂ paratype, which Dr. McDunnough kindly gave me. The shape of the costa of the valvæ and the sacculus, and the type of the saccus, seem to give better characters for separation than the penis in this group, though with more material the results might prove different. The above description is based entirely upon the male genitalia, as I had too few females to spare for slides. Possibly *atlinensis* may prove a northern race of *forsaria*, but I cannot tell without more material, and the sexual characters would seem to keep them apart.

PHENACOCCUS STACHYOS Ehr. (=*P. pettiti* Hollinger).

In the Canadian Entomologist for August, 1917, the writer described, as new, a mealy bug from Missouri. A short time after the description was published, G. F. Ferris called my attention to the apparent similarities that he thought existed between *Phenacoccus pettiti* Hollinger and a certain Californian species previously described by Ehrhorn as *P. stachyos*. A slide mount of the California species was submitted to the writer for comparison with his series of individuals of the Missouri species. Ferris states that the specimen he submitted to the writer is a topotype

of Ehrhorn's species, and so it is with this information that the writer has arrived at a definite conclusion relative to the synonymy. The main characteristic of this species, as mentioned by the writer in the August number of this journal, is the presence of projecting glands in the anal lobes as well as at various points throughout the body of the insect. Ehrhorn overlooked this prominent character in his description, and in so much as that description is lacking in certain details, the few points of similarity mentioned did not lead the writer to suspect that the Missouri species was the same as *P. stachyos* Ehr.

A. H. Hollinger,
Missouri Agricultural Experiment Station, Columbia, Mo.

SOME HETEROPTERA FROM THE PARRY SOUND DISTRICT, ONT.

BY J. R. DE LA TORRE BUENO, WHITE PLAINS, N.Y.

In 1915 Mr. H. S. Parish collected Heteroptera in the Parry Sound District, Ont. His collection was not very extensive, owing to the time of the year he was there. It was typical of the temperate part of Eastern North America. The results are presented here as a fragment towards our knowledge of the fauna of Canada.

The species are arranged according to Van Duzee's Check List, for the sake of conformity, but it should be understood that I do not at all subscribe to that arrangement, as I deem it phylogenetically unsound, for all that it is based (with changes) on the late Prof. Reuter's last work. This, I am sure, he would have modified, had he lived, as he would have come to recognize, e. g., that the Nepidæ bear no close relationship to the Belostomatidæ. Branched antennæ, in subaquatic forms, are no indication of relationship else the aquatic bugs and beetles are akin; they only indicate convergence through function.

Homœmus æneifrons Say, July 10, 26; Aug. 5.
Mormidea lugens Fabr., June 14, 1 sp.
Euschistus euschistoides Voll., June 10, 14; July 1; 4 sp.
Euschistus tristigmus Say, June 8; 1 sp.
Cœnus delius Say, June 28; 1 sp.

Neotiglossa undata Say, June 10, 3 sp.

Cosmopepla bimaculata Thomas, June 14, 1 sp.

Banasa calva Say, June 14, 24, 2 sp.

Perillus exaptus Say, July 10, 1 sp.

Podisus maculiventris Say, June 22, 1 sp.

Alydus conspersus Mont., July 26, 28, 2 sp.

Corizus crassicornis Linn., June 18, 24; July 10, 28; 8 sp.

Corizus bohemanni Sign., June 24, 1 sp.

Neides muticus Say, Aug. 8, 2 sp.

Nysius californicus Stal., Aug. 28, 1 sp.

Nysius ericæ Schill., June 23; July 6, 10, 28; 13 sp.

Ischnorhynchus resedæ Panz., June 7, 9, 22, 23; 13 sp.

Cymus angustatus Stal., June 16, 18, 23, 24, 26; July 6, 7, 10, 23, 26; 13 sp.

Cymus discors How., July 23, 16 sp.

Blissus leucopterus Say, June 18, 1 sp.

Geocoris bullatus Say, June 20, July 8, 2 sp.

Ligyrocoris diffusus Uhl., July 26; Aug. 5, 8; 4 sp.

Sphærobius quadristriatus Barb.? July 23, 25, 26; 6 sp.

Corythucha marmorata Uhl., July 23, 26, 2 sp.

Corythucha sp., June 8, 20; Aug. 6; 10 sp.

Sinea diadema Fabr., Aug. 5, 3 sp.

Pagasa fusca Stein., July 27, 1 sp.

Reduviolus subcoleoptratus Kirby, July 10; Aug. 5; 5 sp.

Reduviolus ferus Linn., June 18; July 10, 26, 27, 28.

Reduviolus kalmii Reut., June 14, 15; July 9, 14, 18, 22; 1 sp.

Anthocorus musculus Say, July 26, 28, 4 sp.

Triphleps insidiosus Say, July 10, 28, 3 sp.

Dicyphus fameliculus Uhl., June 8, 23, 2 sp.

Monalocoris filicis Linn., June 7.

Labops hesperius Uhl., June 7, 14, 23, 24; July 18. Long and short-winged forms. 10 sp.

Acanthia coriacea Uhl., June 22; 1 sp.

Gerris rufoscutellatus Latr., June 11; Aug. 3; 11 sp.

Gerris marginatus Say, June 11, 5 sp.

Gerris buenoi Kish., Aug. 3, 10 sp.

Metrobates hesperius Uhl., Aug. 3, 5 sp.

THE BEE-GENUS BRACHYNOMADA.

BY T. D. A. COCKERELL, BOULDER, COLORADO.

In 1807 Jurine described a curious parasitic bee from Europe, naming it *Pasites maculatus*. A ferruginous variety (var. *brunneus* Friese) occurs in Northern Africa; a specimen before me is from Biskra, Algeria, (*F. D. Morice*). A second species, *P. minutus* Mocs., occurs in Hungary; while *P. friesei* Ckll. comes from Mt. Kilimandjaro in Africa. *P. villosus* Friese, from the Transvaal, is to be called *Margania villosa*. *Pasites* has two submarginal cells in the anterior wings, 12-jointed antennæ in both sexes, and the spine at the end of the female abdomen is entire, not bifid as in *Ammobates*. According to our knowledge of bee-structure, this cannot be a primitive form; it must be derived from an ancestor with three submarginal cells, antennæ 12-jointed in the female, 13-jointed in the male, and possibly the caudal spine of the female divided. Such a type, agreeing in all general features with *Pasites*, is found where we might least expect it, in South America, particularly in Argentina. I believe the relationship between the European and South American genera is a fact, and that we have in America a remnant of a once widely distributed type, which gave rise to the now exclusively old world *Pasites*. The supposed *Pasites* described by Cresson from Cuba is now referred to *Hypochrotœnia*. The South American genus referred to was named by Holmberg in 1886 *Brachynomada*. He had two species from the Argentina, which he called *B. argentina* and *B. chacoënsis*. In 1907 Ducke gave the name *Nomada tomentifera* to a form of *B. argentina*. Friese, in 1908, gave a synopsis of the species known to him, but unfortunately referred them to Holmberg's *Dœringiella*, which is an Epeoline genus. Friese showed that the genus extended into Brazil. The list of species, as it stands to-day, is as follows:

B. argentina Holmbg.
" *tomentifera* (Dke.)
B. chacoënsis Holmbg.
B. franki (Friese).
" *obscuripes* (Fr.).
B. bigibbosa ((Friese).
B. thoracica (Friese).

In 1916 (Ann. Mag. Nat. Hist., June, p. 432) I described a new genus *Austrodioxys*, with the species *A. thomasi* from the Argentine. It has in general the characters of *Brachynomada*, but there are only two submarginal cells. Ducke intimates that two submarginal cells may occur as an abnormality in *Brachynomada;* but there is no reason for doubting that the specimen of *A. thomasi* is normal.

I have before me, from the U. S. National Museum, a small bee collected by Prof. L. Bruner at Carcarana, Argentina. Ashmead examined it and referred it to the North African genus *Schmiedeknechtia* Friese. It is, however, of the *Brachynomada* type, and since it has only two submarginal cells, it ought to go in *Austrodioxys*. Unfortunately, however, the second submarginal cells receive both recurrent nervures, whereas in *Austrodioxys* the first submarginal receives the first recurrent. In *Austrodioxys* it must be the first transverse cubital which has dropped out, but in the Bruner specimen rather the second. Under these circumstances it will probably be best to consider *Austrodioxys* a subgenus only, its type becoming *Brachynomada thomasi* (Ckll.). The Carcarana insect may be described as follows:

Brachynomada subminiata, n. sp.

♀.—Length about 7 mm., anterior wing 5; head and thorax black, strongly punctured; the face, upper border of prothorax, and sides of thorax to a considerable extent, with silvery white hair; mandibles simple with a broad, red median band; lower margin of clypeus polished and exposed; face broad; flagellum ferruginous beneath; cheeks broad, with fine, white hair; mesothorax shining, with coarse punctures; scutellum strongly punctured, broadly truncate, subemarginate in middle; tegulæ rufotestaceous; wings dusky hyaline, nervures and the large stigma dark ferruginous; first s.m. not twice as long as second; second s.m. receiving first r.n. near base, the second a short distance beyond middle; legs rather obscure ferruginous, with white hair, the anterior femora blackened; claws as in *B. thomasi;* abdomen broadly, densely punctured; first segment red; second black, red apically; third red, more or less stained with black basally; 4 to 6 dark; segments 1 to 4 with clear-cut, narrow white hair-bands,

fifth with a more diffuse band; apex with a pair of entirely separate parallel red spines, curved downward; venter red, black apically. (*Bruner*, 17).

The basal nervure meets the transversomedian; the marginal cell is obliquely truncate and appendiculate, exactly as in *Pasites*. The hind legs are much more slender than in *Pasites maculatus*, and the outer apical angle of hind tibia is much more salient. The face, though broad, is not so broad as in the *Pasites*.

LECTOTYPES OF HYMENOPTERA (EXCEPT APOIDEA) DESCRIBED BY ABBÉ PROVANCHER.

BY A. B. GAHAN AND S. A. ROHWER, WASHINGTON, D.C.

(Continued from vol. XLIX, page 433.)

Limneria compacta. Type.—Female, Ent. Branch, Dept. Agr., Ottawa.

Limneria crassicornis. Type.—Male, yellow label 1222. 2nd Coll. Pub. Mus., Quebec. Left antenna beyond middle, right anterior leg at trochanter, left median tarsus and hind tarsi broken off.

Limneria dentata. Type.—Female, yellow label 451. 2nd Coll. Pub. Mus., Quebec. Right antenna gone at scape.

Limneria distincta. Type.—Female, yellow label 1060. 2nd Coll. Pub. Mus., Quebec. Right antenna at scape, left at 6th joint, gone.

Limneria excavata. Type.—Not in Pub. Mus., Quebec, unless under *Limneria valida* Cress.

Limneria flavipes. Type.—Male, yellow label 358. 1st Coll. Pub. Mus., Quebec. Right antenna beyond middle, right wings, left hind wing, gone.

Limneria fusiformis. Type.—Female, yellow label 302. 2nd Coll. Pub. Mus., Quebec. Left antenna at scape, right at apex, gone; median tarsi broken; right hind tarsus and left hind leg at femora, gone.

Limneria guignardi. Type.—Harrington Coll.

Limneria hyalina. Type.—Female, yellow label 299. 2nd Coll. Pub. Mus., Quebec.

Limneria infumata. Type.—Female, yellow label 300. 2nd Coll. Pub. Mus., Quebec. Antennæ and one middle leg broken.

Limneria marginata. Type.—Female, yellow label 703. 2nd Coll. Pub. Mus., Quebec. Antennæ broken, the left before the right beyond the middle.

Limneria nigricoxa. Type.—Female, yellow label 675. 2nd Coll. Pub. Mus., Quebec.

Limneria pallipes. Type.—Female, yellow label 304. 2nd Coll. Pub. Mus., Quebec. Antennæ broken beyond middle, left hind leg beyond coxa missing.

Limneria parva. Type.—Female, yellow label 298. 2nd Coll. Pub. Mus., Quebec. One antenna broken at apex; hind legs gone.

Limneria pilosula. Allotype.—Yellow label 1100. 2nd Coll. Pub. Mus., Quebec. Abdomen glued on label, apex of right antenna gone. Type.—Female not located.

Limneria plena. Type.—Female, yellow label 296. 2nd Coll. Pub. Mus., Quebec. Antennæ and right hind tarsus gone.

Limneria ruficornis. Type.—Not in Pub. Mus., Quebec, unless under *Limneria dentata* Prov.

Limneria ruficoxa. Type.—Female, yellow label 303. 2nd Coll. Pub. Mus., Quebec. Antennæ beyond middle, left hind leg at trochanter, right hind tarsus and ovipositor sheaths, gone.

Limneria rufipes. Type.—Female, yellow label 521 and name label *Limneria mellipes* Prov. Proved by Provancher catalogue. 2nd Coll. Pub. Mus., Quebec. Antennæ broken near middle.

Limneria sericea. Type.—Not located.

Limneria sessilis. Type.—Female, yellow label 348. 2nd Coll. Pub. Mus., Quebec. Antennæ broken before middle.

Linoceras cloutieri. Type.—Female, yellow label 264. 2nd Coll. Pub. Mus., Quebec. Allotype.—Male, yellow label 303. 1st Coll. Pub. Mus., Quebec.

Liris magnifica. Type.—Male, yellow label 1721. 2nd Coll. Pub. Mus., Quebec.

Liris rugosa. Type.—Male, yellow label 1222. 2nd Coll. Pub. Mus., Quebec.

Lonchidia hirta. Type.—Not located.

Lyda burquei. Type.—Female, yellow label 126. 1st Coll. Pub. Mus., Quebec. Lacks left flagellum .

Lyda harringtoni. Type.—Female, Harrington Coll.

Lyda quebecensis. Type.—Female, yellow label 504. 2nd Coll. Pub. Mus., Quebec. Lacks antennæ; only one anterior wing left, and that on pin.

Lyroda subita. Type.—Not located.

Macrocentrus aciculatus. Type.—Female, yellow label 1484. 2nd Coll. Pub. Mus., Quebec.

Macrocentrus longicornis. Type.—Male, yellow label 911. 2nd Coll. Pub. Mus., Quebec. Lacks right antenna.

Macrocentrus mellipes. Type.—Female, yellow label 571. 2nd Coll. Pub. Mus., Quebec. Lacks antennæ; abdomen loose and dirty.

Macrocentrus pacificus. Type.—Ent. Branch, Dept. Agr., Ottawa. Head gone.

Macrocentrus pectoralis. Type.—Male, yellow label 728. 2nd Coll. Pub. Mus., Quebec. Lacks abdomen and some legs; antennæ incomplete.

Macrophya albipes. Type.—Female, white label 157; yellow label 1676. 2nd Coll. Pub. Mus., Quebec.

Macrophya contaminata. Type.—Yellow label 36. 2nd Coll. Pub. Mus., Quebec. Also 2 specimens without labels.

Macrophya crassicornis. Type.—Yellow label 1547. 2nd Coll. Pub. Mus., Quebec.

Megaspilus lucens. Type.—Not in Pub. Mus., Quebec, unless under *Proctotrupes flavipes* Prov.

Megastylus politus. Type.—Not in Pub. Mus., Quebec, unless under *Stilpnus americanus* Cress.

Meniscus ashmeadii. Type.—Not located.

Meniscus crevieri. Type.—Not in Pub. Mus., Quebec, unless under *Meniscus scutellaris* Cress.

Meniscus marginatus. Type.—Female, yellow label 1037. 2nd Coll. Pub. Mus., Quebec.

Meniscus superbus. Type.—Female, yellow label 418. 2nd Coll. Pub. Mus., Quebec.

Mesochorus areolatus. Type.—Female, yellow label 680.

2nd Coll. Pub. Mus., Quebec. Left antenna gone at scape; abdomen glued on yellow label.

Mesochorus flaviceps. Type.—Female, yellow label 358. 2nd Coll. Pub. Mus., Quebec.

Mesochorus humeralis. Type.—Female, yellow label 698. 2nd Coll. Pub. Mus., Quebec.

Mesochorus jucundus. Type.—Female, yellow label 679. 2nd Coll. Pub. Mus., Quebec.

Mesochorus pleuralis. Type.—Female, yellow label 367. 1st Coll. Pub. Mus., Quebec.

Mesochorus politus. Type.—Female, yellow label 681. 2nd Coll. Pub. Mus., Quebec.

Mesochorus rufulus. Type.—Female, yellow label 577. 2nd Coll. Pub. Mus., Quebec. Antennæ broken near base; hind legs except left coxa, and abdomen, missing.

Mesochorus saint-cyri. Not in Pub. Mus., Qubeec, unless under *Echthrus abdominalis*.

Mesochorus truncatus. Type.—Female, white label 464, yellow label 1559. 2nd Coll. Pub. Mus., Quebec. On a short pin.

Mesoleius annulatus. Type.—Female, blue label 259(s); yellow label 1242. 2nd Coll. Pub. Mus., Quebec.

Mesoleius antennatus. Type.—Female, yellow label 338. 2nd Coll. Pub. Mus., Quebec.

Mesoleius canadensis. Type.—Female, yellow label 336. 2nd Coll. Pub. Mus., Quebec.

Mesoleius chicoutimiensis. Type.—Female, yellow label 1584. 2nd Coll. Pub. Mus., Quebec. Most of antennæ and legs gone; right hind leg present.

Mesoleius fissus. Type.—Male, yellow label 339. 2nd Coll. Pub. Mus., Quebec. Lacks apices of antennæ.

Mesoleius inflatifrons. Type.—Female, blue label 445. 2nd Coll. Pub. Mus., Quebec.

Mesoleius junctus. Type.—Male, yellow label 936. 2nd Coll. Pub. Mus., Quebec.

Mesoleius mellipes. Type.—Male, yellow label 413. 1st Coll. Pub. Mus., Quebec.

Mesoleius niger. Type.—Female, yellow label 933. 2nd Coll. Pub. Mus., Quebec.

Mesoleius tardus. Type.—Female, yellow label 337. 2nd Coll. Pub. Mus., Quebec. Abdomen glued on.

Mesoleius telarius. Type.—Female, yellow label 1241, old rose label 74. 2nd Coll. Pub. Mus., Quebec. Right flagellum gone.

Mesoleptus albopleuralis. Type.—Male, yellow label 462. 2nd Coll. Pub. Mus., Quebec.

Mesoleptus angustus. Type.—Male, Harrington Coll., Labelled "Type. Rohw. Gahan."

Mesoleptus annulatipes. Type.—Male, yellow label 1239, name label "*Mesoleptus cinctipes* Prov." Proved by Provancher's catalogue. 2nd Coll. Pub. Mus., Quebec.

Mesoleptus annulatus. Type.—Female, Harrington Coll. Pink label "p. 471" Paratype, yellow label 683. 2nd Coll. Pub. Mus., Quebec.

Mesoleptus barbatus. Type.—Male, yellow label 1230. 2nd Coll. Pub. Mus., Quebec. Provancher mistook sex.

Mesoleptus canaliculatus. Type.—Male, yellow label 322. 2nd Coll. Pub. Mus., Quebec.

Mesoleptus depressus. Type.—Male, yellow label 400. 2nd Coll. Pub. Mus., Quebec. Lacks hind tarsi.

Mesoleptus erectus. Type.—Female, yellow label 399. 1st Coll. Pub. Mus., Quebec.

Mesoleptus fasciatus. Type.—Not located.

Mesoleptus filiformis. Type.—Male, yellow label 1240. 2nd Coll. Pub. Mus., Quebec. Provancher mistook sex.

Mesoleptus flavicornis Type.—Female, yellow label 464, 2nd Coll. Pub. Mus., Quebec. Lacks flagellum beyond first.

Mesoleptus incompletus. Type.—Not in Pub. Mus., Quebec, unless under *Cremastus fusiformis* Prov.

Mesoleptus interruptus. Type.—Female, yellow label 390. 1st Coll. Pub. Mus., Quebec. Part of antennæ gone.

Mesoleptus lætus. Type.—Yellow label 319. 2nd Coll. Pub. Mus., Quebec. Antennæ and abdomen gone.

Mesoleptus largus. Type.—Female, yellow label 1231. 2nd Coll. Pub. Mus., Quebec.

Mesoleptus laurentianus. Type.—Male, yellow label 394. 1st Coll. Pub. Mus., Quebec. Most of left flagellum, left hind leg, apical joints of right hind tarsi gone.

Mesoleptus longipes. Type.—Not in Pub. Mus., Quebec, unless under *M. moveni* Prov.

Mesoleptus lucens. Type.—Male, yellow label 318. 2nd Coll. Pub. Mus., Quebec.

Mesoleptus maculatus. Type.—Not in Pub. Mus., Quebec, unless under *Exyston clavatus* Prov.

Mesoleptus moyeni. Type.—Female, yellow label 315. 2nd Coll. Pub. Mus., Quebec.

Mesoleptus nigricornis. Type.—Female, Harrington Coll.

Mesoleptus perditus. Type.—Male, blue label 165(s); yellow label 1257. 2nd Coll. Pub. Mus., Quebec. Lacks apex of left antenna.

Mesoleptus rhopaloccrus. Type.—Male, yellow label 1561. 2nd Coll. Pub. Mus., Quebec.

Mesoleptus rufipes. Type.—Female, yellow label 406. 1st Coll. Pub. Mus., Quebec.

Mesoleptus rufomixtus. Allotype.—Male, Harrington Coll. Type.—Female not located.

Mesoleptus rufulus. Type.—Female, yellow label 455. 2nd Coll. Pub. Mus., Quebec. Lacks apices of tarsi except one; abdomen glued on yellow label.

Mesoleptus sancti-hyacinthi. Type.—Not in Pub. Mus., Quebec, unless under *Mesoleptus inceptus* Cress.

Mesoleptus seminiger. Type.—Female, yellow label 467. 2nd Coll. Pub. Mus., Quebec. Lacks flagella. Allotype.—Male, yellow label 401. 1st Coll. Pub. Mus., Quebec.

Mesoleptus sericeus. Type.—Female, yellow label 483. 2nd Coll. Pub. Mus., Quebec. Apices of flagella wanting; abdomen loose.

Mesoleptus uniformis. Type.—Female, yellow label 402. 1st Coll. Pub. Mus., Quebec. Cocoon on pin. Labeled *Campoplex unicolor*. Proved by Provancher's Catalogue, Provancher mistook sex.

(To be continued.)

OBITUARY.

SAMUEL T. WOOD.

We regret to record the death of Mr. Samuel T. Wood, of the Editorial Staff of the Toronto "Globe," which took place, after a lingering illness, on Nov. 6, 1917, at his residence in Toronto.

By his death Canada has lost a writer of great charm, and this loss will be felt by a wide circle of readers, particularly among nature lovers, for it was by his writings on natural history that Mr. Wood was best known.

Mr. Wood, who was of Scotch-Irish parentage, was born on a backwood farm in Hastings County, Ont., in 1860, and was educated at the Belleville public and high schools and the Belleville Business College. Having been from his youth an earnest advocate of single tax he was naturally attracted to journalism as a vocation, and after a year on an Ottawa newspaper he entered the service of the Toronto Globe, first as a reporter and later as an editorial writer.

For some twenty years past he contributed a series of Saturday editorials on various phases of natural history, and these articles reveal an accuracy of observation, together with a deep sense of the poetical in nature, which never degenerated into sentimentality. A selection of these articles was recently published under the title "Ramblings of a Canadian Naturalist," and met with a ready sale among the thousands of readers, who were already familiar with his work in "The Globe."

Although more particularly interested in birds, Mr. Wood possessed a love of nature too broad to restrict him to any one branch of natural history, and though he would have been the last person to claim for himself the title of "entomologist," his observations frequently led him to discourse on insects and their ways in his usual delightful manner. He was a member of the Toronto Branch of the Entomological Society of Ontario, and although not an active contributor to its proceedings his presence at the meetings was always welcome, for he was a most intelligent listener, and usually had some pertinent question or observation to make on the subject in hand.

Besides his interest in Natural History he was a keen student of economics, and published many articles on economic subjects, among which may be mentioned a series of short "Lessons in Economics," which for a time were a daily feature in the Globe; and a very excellent "Primer in Political Economy," which he published in 1901.

Mr. Wood had a very quiet and unassuming manner, and a most kindly and attractive personality, which won him a great many friends and admirers. He is survived by his father (Mr. Samuel Wood), his second wife and two sons, to whom we extend our deepest sympathy.

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The fifty-fourth annual meeting of the Entomological Society of Ontario was held at Macdonald College on November 8th and 9th. Among the visitors from a distance were Dr. T. J. Headlee, New Brunswick, N.J.; Dr. W. C. O'Kane, Durham, N.H.; J. H. Emerton, Boston; A. F. Burgess, Melrose Highlands, Mass.; Professor Brittain, Truro, N.S. The more prominent Quebec delegates included Dr. Chapais, St. Denis-en-bas; Father Leopold and Professor Letourneau, La Trappe; G. Maheux, Provincial Entomologist, Quebec; Dr. Corcoran and Professor Higgins, of Loyola College, Montreal; Dr. Willey, McGill University, and Messrs. Winn, Moore and Cummings, Montreal. The Ontario delegates were Dr. Hewitt, Messrs. Gibson, Swaine and Petch, Ottawa; Professor Caesar and Mr. A. W. Baker, Ontario Agricultural College, Guelph; Mr. W. A. Ross, Vineland Station; Mr. F. J. A. Morris, Peterborough; Mr. J. D. Evans, Trenton.

Following is the programme:—

Reports of Council, Treasurer, Librarian, Curator, Branch Societies, Delegate to the Royal Society of Canada, and Directors of Divisions.

"Further Notes on the Imported Onion Maggot," by Mr. Arthur Gibson; "The Entomological Service of Quebec," by Mr. George Maheux; "Some Important Insect Pests of the Season," by Prof. L. Caesar; "Insects of the Season in Quebec," by E. M.

DuPorte; "The European Hemerophila Pariana," by Dr. E. P. Felt; "Black Flies in the Dixville Notch," by Dr. W. C. O'Kane; "Some Notodontian Larvæ," by Dr. J. A. Corcoran; Address of Welcome, by Principal Harrison, Macdonald College; President's Address, by Mr. A. F. Winn, Montreal; "The Problem of Mosquito Control," by Dr. T. J. Headlee; "The Black Cherry Aphis," by Mr. W. A. Ross; "A Comedy of Errors," by Mr. F. J. A. Morris; "Trans-Canadian Spiders," by Mr. J. H. Emerton; "A Further Report on the Value of Dusting vs. Liquid Spraying," by Prof. L. Caesar; "A Few Notes on the Ecology of Insects," by Prof. W. Lochhead, Macdonald College; "The Nervous System of Caterpillars and Its Relation to Classification," by Mr. J. M. Swaine; Motion Picture Film, "Field and Parasite Work Against the Gipsy and Brown Tail Moths," by courtesy of U. S. Bureau of Entomology, Washington, through Dr. A. F. Burgess and Dr. C. Gordon Hewitt; Motion Picture Film, "Orchard Spraying in Nova Scotia," by Professor W. H. Brittain; "The Effect of Stable and Horn Fly Attacks on Milk Production," by Mr. A. W. Baker; "Habits, Behaviours and Tropisms of Insects," by Dr. Arthur Willey.

At the close of the evening session a most valuable symposium took place on the question of how Canadian entomologists can help to increase food production, introduced by Dr. C. Gordon Hewitt, in which many of the members joined.

The following officers were elected for the ensuing year:—

President, Professor L. Caesar, Ontario Agricultural College, Guelph.

Vice-President, Mr. Arthur Gibson, Ottawa.

Secretary-Treasurer, Mr. A. W. Baker, O.A.C., Guelph.

Curator, Mr. Eric Hearle, O. A. C., Guelph.

Librarian, Rev. Prof. C. J. S. Bethune, O.A.C., Guelph.

Directors: J. M. Swaine, Ottawa; C. E. Grant, Orillia; Dr. A. Cosens, Toronto; F. J. A. Morris, Peterborough; J. W. Noble, Essex, Ont.; W. A. Ross, Vineland Station, Ont.

Delegate to the Royal Society of Canada, The President.

W. L.

Mailed January 16th, 1918.

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POPULAR AND PRACTICAL ENTOMOLOGY.

THE HEART OF A WOOD-PILE.

BY FRANCIS J. A. MORRIS, PETERBOROUGH, ONT.

The pity of it is that when you make a new find and are inwardly executing a war-dance, leaping and whooping with triumph, so often Nature conspires to produce on all sides of you the very rarity you are pirouetting over, till your prize is cheap to nastiness. I remember so well the first few spikes of the Adder's Tongue Fern that I found; what miles and miles, what months and months of search with never a sign; but as soon as the secret postern-gate had been surprised, Nature seemed in a pet to withdraw every guard and unmask her positions, so that Adder's Tongue fairly bristled about my path from that day on. The same thing happened with the famous Moonwort from the hour that I found one solitary plant on the top of the Grampians near Killin. And I could cap these experiences with a score of others, *faunal* as well as *floral*.

Last year (1916) on June 29th, I discovered on a leaf of wild grape-vine a tiny, light-grey longicorn covered with round black spots. I had never seen it before, though I recognized its kinship with the few other *Lamiinids* I had surprised at rare intervals. For an hour or more I hunted vainly over grape-foliage, and at last to my delight captured a second specimen. I was in Trenton, Ont. a few days later, and spent most of my time searching over vine leaves; a third specimen thus captured threw me into ecstasies, and when finally a fourth suddenly settled on my thumb-knuckle as I approached a grape-vine, I was in the seventh heaven. The next two days from dawn to dusk were passed in feverish search over hundreds of vines, but all to no purpose.

However, an old dog, you may have observed, will be checked or thrown off the scent a hundred times for once that it's absolutely baffled. On July 6th, having returned to Peterborough, I

determined to give the grape-vines one more scouring, before I gave up my quest as a bad job. I had three rich collecting-grounds that season, of recent windfalls that I was keeping close tab on; but one day, I thought, of the glorious July heat might go in a last effort at these *Lamiinids* even if it did prove a wild-goose chase.

Recalling that I had seen some luxuriant thickets of vine west of Jackson's Park, I made my way out to the place and spent over two hours working slowly round the sides of a clover field whose fences were festooned with the wild grape. For about 10 days within the last week of June and the first week of July, grape-vine is one of the glories of the wayside; its leaves among the most beautiful in all Nature, the tender, slightly bronzed growing shoots, the delicate tendrils, and the flood of perfume wafted from its racemes, fairly capture the senses as nothing else can. All this I revelled in, but of Longhorns, big or little, not a trace could I see.

It was after 4 o'clock when I slung myself over the fence for a short cut down the river valley in the direction of home. By the fence, near where a heap of old rails and some brush had lain, I saw two newly stacked piles of fresh-cut billets of wood. They were short cylinders of cordwood with the bark still on, ranging in diameter from 3 or 4 inches to 7 or 8. My way from the fence led between the two stacks, and as I rounded the corner of the pile on my left, I spied on the top layer one of these little grey *Lamiinids* moving rapidly along the surface of one of the billets. "Moving" sounds tame, but I use the word advisedly: the insect's progress had the speed of running, but the manner of crawling; the creature is flat, not convex, and lies almost as close on the surface it is moving over as those peculiar, flat, crab-like scorpions or wood-spiders found on stumps and under bark.

It was a piece of birch that the insect was crawling on, and casting a hasty glance around, I noticed that the wood-pile on my right was almost entirely birch, while that on my left—except for a sprinkling of birch at the corner—was poplar. However, when I came to look over the birch pile more closely, I could find nothing on it; so I turned once more to the rival stack, and almost im-

mediately spied another specimen, this time on a poplar billet; then I found 2 more, and by the time I had made the round of the pile I had captured 10; before I returned home I had taken 29 specimens, all from the top layer of billets.

Generally the insects kept perfectly still and submitted to capture rather than allow themselves to be disturbed, simply crouching as flat as they could lie in the form where they were resting. If, however, they decided, like a startled hare, to make a sudden dash for it, they very rarely released their hold at the edge of a billet. Occasionally one's attempt to pinch them up from the billet between finger and thumb was a failure; and usually if you thought to drop them into the killing-bottle by simply opening finger and thumb, they declined to humour you, but would run rapidly up your finger in a spiral and elude pursuit. I found it best, whether using a pair of forceps or just the naked hand, to jar them quite sharply in the instant of opening the jaws that held them, so that they fell into the bottle. The insect proved to be *Hyperplatys aspersa* and apparently was emerging from the bark of the poplar; I thought at first the wood was the American aspen, but later I found the stumps from which it had been cut and they were all balsam poplar or balm-of-Gilead. I have since found the beetle very abundant on newly cut poplar of this species, and occasionally on living trees; it is also fairly abundant on staghorn sumach. No doubt the few specimens I had found on grape-vine were really waifs and strays from one of these two trees.

This being the first time I had ever seen *Hyperplatys* at home (so to say), I determined to take all I could get in case the find should prove a lucky haul unlikely to recur. On the 9th and 11th, I secured 22 and 33 specimens respectively; and it was on this latter date that I tried turning over every billet in the 2nd and 3rd layers as well as the top. Had the result been merely to increase the total of captures, the experiment would not have been worth repeating. But on taking a billet from the 3rd layer, I discovered nestling snugly up against one of the blackened furrows in the area of a branch-axil, a dusky grey insect that at first I took for a crouching spider. So well had it chosen its station, that but for a certain symmetry about the little patch of grey and

black that it made there, I should never have detected it; as it was, my eye was arrested by a sense of design, and, focusing on the patch, at once unmasked the live insect; a moment more, and the longicorn was betrayed by its antennæ; these were thrown back over the creature's body and lowered almost to the space between its elytra and the up-gathered legs, in an attitude I soon came to know as entirely characteristic.

The insect was about the size of *Graphisurus fasciatus* or *Hoplosia nubila*, robust and somewhat convex, but tapering towards the tip (being both narrowed at the sides and declivous above); it reminded me considerably of *Leptostylus sex-guttatus*, but was larger and quite strongly armed at the sides of the thorax; when tested by LeConte and Horn, but for one important point, it seemed to be undoubtedly *Liopus;* and in that genus it could only be *variegatus*, for all the other species were too small. None of the authorities described my form of the insect in detail, though reference was made to a variety *obscurus* which seemed to correspond; I had some specimens in my cabinet from New Jersey and New York labeled *L. variegatus*, and they were all yellowish-brown mottled, while mine was grey-black mottled; but what troubled me most was the point in LeConte and Horn: *Liopus* should have no trace of ciliate hairs beneath the antennæ, and this beetle —especially on the 3rd joint— showed a fringe of from 3 to 6 hairs. On examining my specimens from New Jersey I found them without trace of ciliæ, but on the New York specimens I found one or two such hairs. I have captured nearly a dozen since then, and all show traces of ciliæ, some quite as strongly as *Hyperplatys*, nor can I place my insect in any other genus. I, therefore, infer that the rule-of-thumb distinction between ciliate and non-ciliate genera does not apply to the *fauna* of our northerly latitudes*.

I was so much encouraged by this find that I determined in future to turn over every billet in the 3 rows that made the woodpile. I went there the very next morning, July 12th, and proceeded to do my chore. From the top to the bottom was fully 8 layers deep and it took just about 2½ hours to turn over every

*I find this inference corroborated by specimens of *Liopus cinereus* and *L. alpha* captured near Peterborough, F. M.

billet; I suppose I had never handled so much cordwood in my life before, but it was well worth the trouble, and I was still crying for more as greedily as Oliver Twist, when I laid down the last billet after running my eye over all the bark of its surface. My catch included 46 specimens of *Hyperplatys*, 2 of *Liopus variegatus*, and 3 of a grey-looking *Liopus* said to be a variety of *alpha* known as *cinereus;* I have since learned to associate this ashy-grey form with the poplar, and the yellow-grey form of *L. alpha* with staghorn sumach. Besides these I captured a light-grey longicorn as large as *Graphisurus*, but with very strongly clavate antennal scapes, and having (besides the lateral spines of the thorax) 4 tubercles, a pair on the thoracic disc and a pair on the elytral base. It is unquestionably *Acanthoderes*, probably *decipiens* but I am not sure; this was indeed a rich haul.

On July 10th I turned over my billets of cordwood once more, and besides seeing a great many specimens of *Hyperplatys*, captured 2 more specimens of *L. variegatus* and a single specimen of *Pogonochærus*. In making an examination of this last, I could not find it to differ in any respect from the insect I had occasionally taken on white pine; but I am told that an American authority has distinguished a form he calls *P. salicola* (*sic!*) from the normal *P. mixtus*. I suppose one may be over-sensitive about mere language, but the desire to clip words down by a syllable or two often combines very disastrously with our modern neglect of the Classics. This variety of *Pogonochærus mixtus* feeds on willow and should, of course, (as any of Macaulay's schoolboys would gladly tell you) be *salicicola;* the telescoping of the middle pair of syllables unfortunately condemns the insect to durance vile in a salt-mine! There is an even more terrible example of what grammarians call "solecism" in the science of botany; I recall the delicious piece of irony that even gentle Asa Gray was goaded into over this barbarism: it appears that the man who discovered a kind of holly with blossoms set on long, thread-like stalks, wishing to name and describe his find in a single breath, christened it "*Nemopanthe*" under the fond delusion that this would mean "thread-stalk blossom;" he should, however, have called it "*Nemato-pod-anthe*," and the portmanteau word that he perpetrated was too much even for the sweet-tempered father of American botany. The vein of irony is

so rare in a technical book of science that it has a surprisingly refreshing, even exhilarating effect, like the sarcastic definitions Dr. Johnson inserted in the original edition of his great dictionary.

On the 17th, I took two more *L. variegatus;* one *Pogonochærus mixtus;* a beautifully coloured *Chariessa pilosa;* a little clerid of peculiar form, the elytra being narrower at the base and slightly dilated towards the tip; and three specimens of the pretty little *Endomychus biguttatus;* besides several species of *Curculio* and *Staphylinid.* I was under stern surveillance to pack for our annual trip to the Algonquin Park next day, but by secret calculations of a most intricate sort I proved to my own satisfaction that there was plenty of time to visit the wood-pile as well as to pack; besides, as I philosophised, the weather was far too hot for packing, and simply ideal for handling a cord or two of wood. Accordingly about 4 a.m., all unknown to Xanthippe, Socrates and the sun rose in concert over the brow of the hill and were soon absorbed in contemplation of the wood-pile.

I was somewhat embarrassed once or twice by the operations of a farmer going round and round the adjoining clover field on one of those primitive scythe-bearing machines called mowers that have presumably descended from the ancestral British war-chariots. He did not say anything, but his manner was distinctly unpleasant and spoke volumes of mingled suspicion, curiosity and contempt. To my relief, however, he appeared to decide that I was harmless and he need not interfere. This last day's experience proved both rich and varied. I took 5 specimens of *L. variegatus;* 1 *Parandra brunnea;* 1 *Saperda calcarata* (dead); 1 *Lepturges;* 1 *Leptostylus sex-guttatus;* and 1 *Acanthoderes.* In addition I saw many *Hyperplatys,* and received striking proof of "Nature red in tooth and claw," even in this peaceful, sunlit dwelling in Arcady.

My suspicions had often been roused by the number of large, black assassin-bugs in the dark recesses of the wood-pile; but the whole aspect of the place as one approached it—like Macbeth's castle to the gentle fancy of King Duncan—was peaceful and sunny; if there were no martlets flitting about it, there were butterflies galore that sailed and settled. And all the time it was the abode of murder: on the daggers of those assassin-bugs were gouts of blood. I captured one of these black marauders with a fair

specimen of *Hyperplatys* impaled on its proboscis; it had thrust the deadly stiletto through the suture of the elytra, and found the soft, defenceless body between the joints of the harness.

Nor was this all. In "The Toilers of the Sea," Hugo's famous romance of the Channel Islands, you will remember how the hero Gilliat entered the sunny sea-cavern only to find himself caught in the toils of the giant cuttle-fish. In the hollow of this wood-cave, too, lurked a monstrous Octopus. As I neared the end of the pile, I saw a huge, grey and black spider, with great hairy legs and massive obcuneate forepart (the thick end of the wedge being forward and a pair of glittering little eyes projecting out of the black mass) plunge out of sight between two piles of billets, and I fancied, in the flash of its dive, that it had a big blue-bottle in its jaws. I got my forceps ready and kept careful watch as I turned over the billets; and presently I drove him from cover and seized one shaggy thigh in the relentless grip of my steel vice. Cheek by jowl in my cabinet, staring stark and stiff, are set the killer and his prey, *Phidippus audax* and a last specimen of *Liopus variegatus*, for that was what the blue-bottle proved to be. The spider had not attempted to wedge his huge jaws in at the suture of the wing-covers, but had dug them in on the under side between chest and body, and sucked his victim so viciously that the ligaments between thorax and abdomen were wrenched apart and the elytra disjointed and loose.

NOTES ON BARNES' AND McDUNNOUGH'S "*CHECK LIST OF LEPIDOPTERA OF BOREAL AMERICA*."

BY F. H. WOLLEY DOD (ON ACTIVE SERVICE).

(Continued from page 16.)

Cirphis Walk., *Roseola* (1937) is probably a variety of *farcta* (1938), and *calgariana* (1945) of *anteroclara* (1942). *Anteroclara* and *farcta* are too nearly allied to be separated, as here, by *imperfecta* and *insueta*. *Heterodoxa*, *dia* and *megadia* stand as varieties of *insueta*, and this is very likely correct, except that the first two named are questionably distinguishable forms. The type of *dia* in the British Museum differs in negligible detail from some Calgary *heterodoxa* in the same collection.

February, 1918

Borolia Moore. *Amygdalina* is correctly separated from *linita* to which Hampson refers it. The former occurs at Winnipeg, and specimens are in the Museum from Maine (type) and New Jersey. *Linita* is a longer and narrower winged species with more concave outer margins, occurring in Florida. Hampson's figure under *linita* is of type *scirpicola*, which is now correctly referred to *Cirphis* with *calpota* Sm. as a synonym. It is a close ally of *phragmatidicola*.

Neleucania Sm. The reference to *albilinea* of *obscurior*, *neptis* and *limitata*, three of Smith's names, is in accord with my diagnosis, though I can scarcely consider *obscurior* as a variety. I am inclined to agree with Hampson in adding *tetera* Wm., which the authors keep distinct.

Leucania Ochs. As in Hampson's catalogue, *minorata* stands as distinct from *luteopallens*. I can see nothing to warrant the separation. *Rubripallens* is probably only a red variety of the species, though I have nothing compared with the type. *Pertracta* Morr. is included in the genus. When I saw the type of this it impressed me as probably of foreign origin, but as it apparently has not been so far identified as any other known species, it is correct that the name should be retained in our lists. Unless memory fails me, the species would be better referred to *Cirphis*. *Yukonensis* Hamps. (Ann. and Mag. Nat. Hist., VIII, p. 425, 1911) has been inadvertently omitted. *Suavis* B. & McD., judging from a co-type in the British Museum, is quite unlike any of the others now referred to this genus, and does not seem to belong here at all.

Copicucullia Sm. I told Smith that, after examining the types, I believed *bistriga* and *mala* to be, as the authors have described, identical with *eulepis*, but he would not accept that view.

Oncocnemis Led. *Poliochroa* Hampson stands as a synonym of *chandleri* Grt. (2069), whilst *chandleri* Hampson is referred to *colorado* Smith (2070). The latter reference is almost certainly correct, and I had long suspected it. The reference of *poliochroa* to *chandleri* is based on the claim that Grote's original figure is the strongly marked form with contrasting

border to secondaries described as new by Hampson, and that, therefore, the supposed type of *chandleri* in the British Museum can only be the variety mentioned by Grote in his description. I cannot agree as to Grote's figure. There are two Colorado (Mead), specimens in the Museum, very much alike, one of them bearing Grote's type label. Grote's figure might very well be of the other, though the secondaries are represented too dark, it is true, but they are not dark enough for *poliochroa*. I am not satisfied that the *chandleri* of Hampson is not Grote's species.

O. riparia Morr. (2046) described, by the way, as a variety of *chandleri*, seems to be too close an ally of *colorado* to stand so far apart from it. *Cibalis* (2048) belongs in the same group.

O. atrifasciata Morr. *Piffardi* Walk. is entered amongst the additions as a prior name to Morrison's. The description of *Phornacisa piffardi* (Trans. Ent. Soc. Lond. 3rd series, I, p. 312, 1864) which was recently accidentally discovered by Sir George Hampson, has been previously overlooked by everyone. It most obviously applies to the species subsequently described by Morrison, and Walker's name label has been found beneath the Nova Scotian specimen in the British Museum, which, that being the locality mentioned by Walker, is, by assumption, the type.

O. æqualis Grote stands as a synonym of *major*, following Smith and Hampson. Types of both names are in the Museum, and I find it hard to believe that they are the same species. A pair of *æqualis* from Eureka, Utah, agree with the type, and I have a series of that in my own collection, but nothing like *major*, which is figured by Hampson. I understand that there is a type of *major* in the Neumoegen collection.

Dunbari Harvey makes its first appearance in *Oncocnemis*. It was redescribed as *definita* by the authors under *Oxycnemis*, but later they referred the name to Harvey's species. I recognized the type in the Henry Edwards' collection in 1910 as a species I had previously seen in one or two collections, but did not then possess, but I overlooked the fore tibial claw. I now have a specimen from Vancouver Island. The form

described and figured by Hampson as *dunbari* is probably a strongly marked form of *Lithalomia napæa*.

Momophana Grt. *Columbiana* Sm. stands as a variety of *comstocki* Grt. I am by no means convinced that they are the same species.

Graptolitha Hbn. *Winnipeg* immediately follows *laticinerea*. I consider them synonymous. *Merceda* (2159), should be referred to *unimoda* (2150). I compared Smith's type some years ago, and came to this conclusion. There is a co-type of *merceda* in the British Museum from Cartwright, Man. This specimen has the maculation clearer than eastern specimens, and being rather small, is undeniably *tepida*-like in appearance, but I am satisfied that it is really *unimoda*. *Atincta* stands as a variety of *tepida*. It seems to me an exact synonym. Heath used to send me *tepida* as both *atincta* and *merceda*.

The six names referred to *georgii* are correct, but questionably recognizable as standing for varieties.

Conistra Hbn. *Walkeri* is treated as a synonym of *sidus*, and *colorado* as a variety. The latter reference is new to me, but very likely correct. *Walkeri* I have never succeeded in recognizing as distinct, and am satisfied to accept the reference.

Parastichtis Hbn. is used for *Amathes* of Hampson, and *Orthosia*, part, of Smith. I strongly object to *verberata* being treated as a variety of *bicolorago*. I have pointed out the differences in my Alberta notes, and have since found that the genitalia differ. Nor do I believe that *acta* is distinct from *decipiens*. My tentative reference of *insipida* Strk. to *inops* Grt., made after seeing Strecker's type in 1910, has been confirmed by the authors. *Americana*, which Smith considered a probable foreigner, has been retained, and so has *immaculata* Morr., a species still unrecognized, I believe.

Trachea Ochs. *Ferida* Smith stands here, as per Hampson. I believe it to be a *Eumichtis*, and associate it very closely with *miniota* Smith. *Purpurissata* B. & McD., described from Vancouver Island, which happens to be the "*auranticolor*

ab. I" of Hampson, is referred as a var. of *antennata* Smith. I have nothing identified as the latter. *Separans* Grt. (2288) is best placed next to *indocilis* (2285), and *enigra* (2312) placed in the list between *commoda* and *illustra* should probably come next. I am of opinion that the first three named will ultimately prove to be forms of one species. The genitalia do not differ. *Obscura* Haw. (*gemina* Hbn.) of Europe has an almost exactly similar range of variation. *Illustra* is a black, almost immaculate var. of *commoda*.

Probata B. & McD. is correctly referred as a synonym of *fumeola* Hampson, and the re-description was explained by the authors in their "Contributions," Hampson's figure representing a different species from his type. I recognized the latter fact when I saw the British Museum series about ten years ago. Of the species figured by Hampson I had then a duplicate, but lacking other specimens, long held it under a mss. name. All the specimens mentioned in the catalogue except the type of *fumeola* are this species, and there is one in the collection from Fraser River, B.C., (Mrs. Nicholl). A few years ago I received it in some numbers from Miss McGlashan, from Truckee, Calif. Sir George Hampson intends to name it *perfumosa*. *Luteocinerea*, (2305), by my comparison with the type is a form of *characta* (2303). *Jocasta*, standing between these names, seems to me a very close ally of *claudens*, which is referred by Hampson and the authors to *Eremobia* Steph. I agree with the authors in considering *mixta* Grt. a good species. The resemblance of Grote's type is so very close that I had formerly passed it, and one other in the British Museum with it, as worn examples of *impulsa*. I have a specimen from Winnipeg from Mr. Wallis.

Perigea Gn. No. 2323 should read *xanthioides*, not *xanthoides*.

Oligia Hbn. *Modiola* Grt., with *mactatoides* B. & McD. as a synonym, stands as a variety of *fractilinea*, possibly as a result of the writer's suggestion in litt. *Misera* Grt. is very likely the same species. European *secalis* Linn. (*oculea* Linn.), of which *fractilinea* is the North American counterpart, has a

wide range of variation which practically covers all these forms.

Agroperina obliviosa Walk. is kept distinct from *lateritia*. I suggested this in Can. Ent. XLIII. p. 231, and Dr. McDunnough came to the same conclusion after examination of the type. I have examined it on several occasions since the publication of my note, and my opinion has weakened. It may be a sub-alpine form. *Satina* Walk. stands next. Though I have not seen the type a second time, I hold firmly to my original contention that this is *commoda* Walk. That *commoda* can sometimes resemble *lateritia* rather closely I have admitted in the course of my notes upon the Heath collection, but am quite satisfied as to the identity of Strecker's type. *Morna* Strk. is placed in the *conradi* group, where Hampson places it, and to which I have stated that it does not belong. I considered it a *Luperina*, and Smith a *Sidemia*. I assume that Messrs. B. & McD. have specimens compared with the type, or at least have recognized it, and as I have very rarely met with anything which I have suspected of being *morna*, and have nothing under the name in my collection, I must accept their word as to its associates. But the *morna* of Hampson is *indela* Smith.

The authors list *conradi*, *citima*, *pendina*, *lineosa*, *indela* and *inficita* as six species. *Pendina* is a red variety of *lineosa*. The more I study the others, the less am I able to separate them. My *identification* of *conradi* is possibly wrong.

Eremobia Steph. *Alticola* Sm. stands next to *maillardi* (*exulis*). If the British Museum specimen standing under Smith's name is correct, the close association seems fully justified.

Sidemia Staud. The writer's reference of *speciosa* Morr. to *devastatrix* is here confirmed. (Cf. Can. Ent. XXIV, p. 359).

Luperina Bdv. *Ona* Smith is placed next *burgessi*. They resemble one another closely, but *ona* appears to be a longer and narrower winged species, with heavier thoracic tufting, better placed in *Septis* Hbn. Hampson has it in the collection under *Parastichtis*, for which the authors substitute Hübner's name.

Phuphena Walk. All the specimens of *u-album* which I have so far had an opportunity of examining, and which have possessed hind tibiæ, have had a spine between the pair of spurs, and the species is, therefore, probably an Agrotid.

Acronycta Ochs. I had hoped to see fewer species here. I have found it difficult to get hold of much material in many groups of this genus, and so closely do some of the species approximate one another, that opinions formed from examination of too limited material of doubtful forms, are rather risky. The authors have seen far more than the writer, and the benefit of the doubt has probably favoured numbers. I am glad to see *modica* next *exilis*, but should like to see *clarescens* (2442) next *hæsitata* (2437), and *increta* (2452) next *inclara* (2444). The identity of *hamamelis* has again been under dispute. *Minella* I believe to be a variety of *fragilis*.

Lepusculina cinderella, *canadensis*, *populi* and *chionochroa* are certainly well placed very close together, but are very doubtfully five species. If *vulpina* Grt. and *sancta* Hy. Edw. are really forms of *leporina*, that may be North American after all, though I had decided that it was not. I still claim that *mæsta* is a variety of *cretata*, though it is here listed as distinct. *Eldora* Sm. stands as a variety of *americana*, probably correctly. *Distans* and *impressa* stand apart for future judgment. *Dolorosa* stands as a var. of *distans*, in accordance with its author's description, and *emaculata* as var. of *impressa*. I see no reason for separating *dolorosa* from *impressa*.

Andropolia Grt. *Illepida* seems correctly referred to *diversilineata*. The type material of *resoluta*, similarly referred, included an almost white variety.

Hyppa Dup. *Rectilinea* is on the "omitted" list, as not North American. *Xylinoides* replaces it in our fauna, but I find them more nearly related than I once thought.

Pyrrhia Hbn. The name *cilisca* is omitted, and *exprimens* and *stilla* are referred as varieties of *umbra*, with *angulata* a synonym of *exprimens*. The distinctness of *umbra* and *cilisca* is perhaps doubtful, but I think the omission of the latter

name was an oversight, even if *umbra* was to be retained. The genitalia of *exprimens* and *cilisca* differ, which supports my view as to their being two species. The treatment of *stilla* is new. I have only one specimen, from Dr. Barnes, and had suspected that it might quite possibly be a variety of *exprimens*, and have seen Vancouver Island specimens of the latter coming very near *stilla*.

Ipimorpha Hbn. I believe that *subvexa* (2726) is very likely a variety of *pleonectusa* (2724). I long ago suggested that *nanaimo* (2725) might be *subvexa*, but the authors keep the three distinct. I possess nothing named *nanaimo*, and am content to accept it as it stands for the present.

Enargia Hbn. *Infumata* Grt., with *punctirena* as a synonym, is listed as a form of *decolor* Walk. This is in accordance with Hampson. Had I not seen the two in nature side by side, and found one sometimes present in certain seasons without the other, I should probably have held the same opinion, and the male genitalia being alike would lend support to that view. As it is, I hold to my former opinion that they are two very closely allied species.

Eutricopis Morr. *Elaborata* Hy. Edw. is a form with the dark markings rather thickly irrorate with yellow scales. The placing of the name by the authors as a synonym of *nexilis* Morr. seems to indicate that the latter is of this form also. If that is so, then the much darker form with purplish or vinous red shades, found at a high altitude in the Rockies, deserves a varietal name.

Catocala beaniana Grt. This stands as a form of *unijuga*. The form was unknown to me until quite recently when I examined the type. It is very difficult for me to believe that the reference is correct. Dr. McDunnough has doubtless seen it, and confirmed Hulst's reference, which was followed by Smith.

Cœnurgia Walk. *Sobria* Walk. appears, as in Hampson, as a synonym of *crassiuscula*. Grote referred it to *erechtea*, and

that reference was followed by Smith. I refer *sobria* to *convalescens*. The type is a female, and agrees with the male type of *purgata* Walk. in maculation, though not in colour.

Autographa Hbn. The first twenty species here listed have mid and hind tibiæ spined, and are referred to *Syngrapha* by Hampson. *Ou* has all the tibia spined, a character which was somewhat overlooked by Hampson, or he would have placed it, with *pedalis*, in *Rachiplusia*. I agree with the authors of the new list in considering *pedalis* Grt. an abberation of *ou*.

Russea Hy. Edw. which Hampson followed Ottolengui in referring as a variety of *californica*, the present authors treat as a variety of *pseudogamma*, which I cannot believe to be correct. *Microgamma* Hbn. makes its first appearance in our lists, the only North American records, so far as I know, being from Alberta. In Europe it occurs in Austria, Northeastern Germany, Scandinavia, Lapland, Finland and Russia. *Sansoni* Dod is placed between *pasiphœa* and *metallica*. I consider its nearest ally to be *rubidus*. Its yellow underwings, however, dissociate it somewhat from others of the genus having smooth tibiæ.

Drasteria Hbn. *Capiticola* Walk. (3327), misspelt *capticola*, appears to the writer to be a synonym of *graphica* Hbn., and not distinct as listed.

Syneda Gn. The nearest ally of *petricola* Walk. (3331) is *athabasca* Neum. (3336), and I am by no means assured that they are not forms of one species.

Pheosia dimidiata H.-S. This is one of the familiar names which is included in a list of those omitted as not referring to North American species. It has long stood as prior to *rimosa* Pack., but the merest glance at Herrich-Schäffer's figure leads one to wonder who was responsible for the mis-identification. According to the British Museum collection the name refers to a South American species described latterly as *Rhuda endymion* Schaus., from Rio Janiero.

ON SOME NEW OR NOTEWORTHY COLEOPTERA FROM THE WEST COAST OF FLORIDA.—IV.

BY W. S. BLATCHLEY, INDIANAPOLIS, INDIANA.

A further study of the Coleoptera collected by myself during the winter season of 1916-17, and those taken at porch light and sent me in June and July, 1917, has revealed the following species worthy of note or apparently undescribed. Unless otherwise mentioned, all the species were taken at or near Dunedin, a town on Clearwater Bay, 21 miles north of St. Petersburg, Florida.

Platynus octopunctatus Fab.—A single example of this handsome and easily recognized Carabid was taken February 13 from beneath rubbish on the site of a recently drained pond. Schwarz records one specimen from Tampa, and Leng has one or two from "Fla." In Western Indiana it occurs frequently in winter beneath cover on the slopes of sparsely wooded hills.

Bidessus floridanus Fall.—Of this species, which bears a close general resemblance of *B. pulicarius* Aube, a dozen or more specimens have been taken at Dunedin, and one or two at Sarasota and Kissimmee. Fall's types are from Jacksonville, and it probably occurs throughout the State.

Celina grossula Lec.—One specimen was taken at Gainesville on February 7. Schwarz records it as very rare at Enterprise and Jacksonville.

Hydræna marginicollis Kies.—This minute Hydrophilid occurs in small numbers beneath immersed boards in the ponds about Dunedin. Like *Notomicrus nanulus* Lec. it only becomes visible when it moves. Schwarz lists it as rare, but mentions no definite locality.

Tropisternus sublævis Lec.—No previous record of the occurrence of this species in Florida can be found. It was described from Nebraska and Georgia. Single specimens were taken at Dunedin on January 30 and February 23, and another at porch light on June 20.

Ditoma carinata Lec.—A single specimen was taken beneath the bark of a magnolia log at Gainesville on February 7. Recorded from Tampa and Enterprise by Schwarz.

Bothrideres geminatus Say.—A dozen or more taken on December 16 and January 6 from beneath the close-fitting bark of a dead water-oak. Crescent City (Schwarz in Mss.).

Lathropus pictus Sz.—One specimen taken March 6, while beating in a wet hammock. The types were found at Haulover beneath bark of a dead oak. Known also from Key West and Biscayne Bay.

Loberus subglaber Casey.—Occurs in numbers on the seablite, *Batis maritima* L., on Hog Island. Casey described it* from New Jersey, and this is the first published record for Florida.

Hesperobænus rufipes Lec.—Described† from the "Southern States," as "rare," and said by Horn** to occur in Missouri, Georgia and Louisiana. A dozen or more specimens were secured on December 24 from beneath the bark of an oak log.

Tenebroides bimaculata Melsh.—Though Horn says‡ that this species is common in the Southern States I can find no record of its occurrence in Florida. A single specimen was beaten from dead vines on March 6.

Monocrepidius debilis Lec.—This species was described[1] as an *Athous* from a single specimen taken at Lake Harney, Florida, in May. Three have been secured at Dunedin, two by beating in a wet hammock on March 22 and April 6, the other at porch light on July 10. The third joint of antennæ is at least one-fourth longer than the second, not equal to it as stated by LeConte. Tampa (Schwarz in Mss.).

Monocrepidius aversus Lec.—Two specimens at porch light, June 20—July 5. Described from Georgia as rare. No previous Florida record.

Elater sturmii Germ.—A single example was taken at porch light on June 12. Schwarz records one from Enterprise. It is known only from Florida.

Ozognathus floridanus Lec.—This species ranges from New Jersey to Texas. As pointed out by Fall, the head and thorax are

*Journ. N. Y. Ent. Soc., VIII, 1900, 83.
†Smithson. Missc. Coll., 167, 1863, 65.
**Trans. Am. Ent. Soc., VII, 263.
‡Proc. Phil. Acad. Nat. Sci., 1862, 87.
1. Proc. Am. Phil. Soc., XVII, 405.

often rufous, two of the four specimens at hand from Dunedin being thus bicolored. All were beaten from oak along the margins of ponds.

Eutylistus tristriatus Lec.—While ranging from Pennsylvania to Texas, this species is recorded from Florida only from Key Largo. Single specimens have been sifted from dead leaves at Dunedin on January 16 and March 21.

Cis impressa Casey.—A single male of this well marked form was taken at porch light on June 10. Chas. Dury, of Cincinnati, Ohio, who has in press a monograph of the family Cioidæ, has verified the determination. Casey's types were from California and Washington. Other members of the family taken at Dunedin are *Cis hirsuta* Casey, described from Lake Worth, common; *C. ursulina* Casey, described from Alabama, *Ennearthron pullulum* and *Ceracis punctulata* Casey, scarce. Several new species, descriptions of which by Dury will soon appear, have also been taken.

Canthon perplexus Lec.—One specimen taken at light on July 10. While it is said by Blanchard* to range from Illinois to California and Yucatan, no other Florida record can be found.

Canthon probus Germ.—One specimen was taken from a bucket of water on February 10. Schwarz records one only from Enterprise. Known also from Crescent City and St. Augustine.

Copris inemarginatus sp. nov.—Form of the common *C. anaglypticus* Say, but usually smaller. Clypeus shorter, its front margin *entire* and less reflexed, its surface punctures less distinct, more granulate. Thorax more shining with sides behind the front angles much less sinuate than in *anaglypticus*, the angles themselves not in the form of a small, obtuse tooth as there; sculpture much the same, but the punctures, especially those on sides, more distinct and ocellate; elytra with intervals more shining, less convex and wholly smooth instead of closely and minutely punctate as in *anaglypticus*. Front margin of prosternum without the small, obtuse tooth seen in that species. Both sexes with a very short, obtuse horn or tubercle at middle of head; front half of thorax wholly unmodified and much less declivous than in *anaglypticus*. Length 11.5–15 mm.

*Trans. Amer. Ent. Soc., XII, 1885, 167.

Described from 14 specimens taken at Dunedin, two beneath dead turtle on January 20, the others at porch light in June and July. In the Fall and Dury collections and in that of the American Museum of Natural History, this stands as *C. mœchus* Lec., a Texas species 19 mm. in length, with clypeus obtusely notched at middle, thorax sparsely and irregularly punctured and horns more strongly developed than in *anaglypticus*. Dury writes that his single specimen from Port Orange, Florida, was so named for him by Horn and Ulke, but that "it varies widely from LeConte's brief description of *mœchus*, and it cannot be *anaglypticus*." Fall states that "I have had this with the label '*mœchus*' for many years, but don't know on whose authority the identification rests. On looking at it now with the table in hand it does not seem possible that it can be *mœchus*. It certainly is not *anaglypticus*." Mutchler writes that the three specimens labeled "Fla." in the American Museum collection, agree with the description of *mœchus* only in having the thorax not opaque. Specimens in the U. S. National Museum from Enterprise, Fla., are labeled *anaglypticus* and H. S. Barber writes that both he and Mr. Schwarz believe that the species is "merely a depauperate form, due to biological conditions of which we are now ignorant, but which is not specifically distinct from *C. anaglypticus*. It is certainly not *C. mœchus* Lec."

As these most eminent living American Coleopterists cannot agree upon the name for this species, I have decided to give it that of *inemarginatus*. The "biological conditions" mentioned by Barber are doubtless prevalent throughout the peninsula of Florida, as the beetle seems to be widely distributed over that State. If they are sufficient to put the shine on its surface, take the notch out of its clypeus and put the punctures in its elytral intervals, it is certainly worthy of a distinctive name. If it be a mere form of *anaglypticus*, as Schwarz and Barber believe, then our conceptions of that species are wholly wrong, and all our tables of the genus *Copris* will have to be greatly modified.

Trox erinaceus Lec.—Numerous specimens at carrion traps, February 5–24. The first published Florida record. Horn gives its range as New Jersey to Georgia and Indian Territory.

Lachnosterna boops Horn.—Frequent at porch light in June and July. Described from Northern Georgia; known also from Tampa, Crescent City and Indian River (Schwarz Mss.).

Ecyrus dasycerus Say.—A single specimen taken by beating dead vines in a wet hammock.

Ataxia crypta Say.—Two specimens in December by beating oak, one April 26, at porch light. Recorded by Schwarz as rare at Ft. Capron. Known also from St. Augustine, Crescent City and Key West.

Monocesta coryli Say.—Two specimens of this large Chrysomelid were recently sent me by Dr. E. W. Berger of Gainesville. They were taken at Palmetto, Fla., on July 3, where they were found feeding on elm. Horn* states that the beetle occurs in Virginia, Illinois and Kansas. It is also recorded from Missouri, but no reference to its occurrence south of that state can be found.

Disonycha mellicollis Say.—This species, known from Indiana to Louisiana and Texas, has been found about Dunedin only beneath boards near the edge of high tide along the beach of Clearwater Bay, where it occurs in small numbers throughout the winter. Known also from Ft. Capron.

Epitrix fasciata sp. nov.—Oval, moderately convex. Head and thorax dull reddish brown; elytra dull yellow with a broad median blackish cross-bar, this interrupted on the second and third intervals, thus forming an oblong sutural spot which is slightly prolonged forwards, and a large spot on each elytron; antennæ, legs and prosternum dull yellow, abdomen piceous. Head very minutely and sparsely punctate. Thorax two-thirds wider than long, sides feebly curved, front angles obliquely truncate, hind ones rounded; disc rather coarsely, deeply and closely, not densely, punctate, the ante-basal impression deep. Elytra at base but slightly wider than thorax, widest at middle, sides broadly rounded, umbone small, oblong; striæ with rows of large, rounded punctures separated by one-half their own diameters; intervals narrow, con-

*Trans. Am. Ent. Soc., XX, 61.

vex, each with a row of prominent semi-erect, yellowish hairs. Abdomen very sparsely and finely punctate. Length 1.6 mm.

Two specimens were swept from low herbage on Hog Island, opposite Dunedin, on April 2, one of which escaped from the net and avoided recapture. The type is unique in coloration and smaller than any species except *brevis*, from which, aside from colour, it differs in its much less convex form and deep, ante-basal impression.

Haplandrus ater Lec.—Two specimens were taken on January 6 from beneath the bark of a water-oak. Schwarz records it as rare at Tampa in decaying pine logs.

Hymenorus elbertæ sp. nov.—Elongate-oblong, moderately convex, shining, thinly clothed with semiprostrate, yellowish hairs. Head, thorax, antennæ, legs and prosternum uniform dull red; elytra fuscous-brown; under surface, except prosternum, dark reddish brown. Head rather finely and closely punctate; eyes large, separated by two-thirds their width; antennæ much more slender than in *densus*, third joint one-half longer than fourth. Thorax but slightly wider than long, sides parallel from base to middle, thence broadly curved and rounded into the apex, hind angles rectangular; disc with a faint, broad, longitudinal median impression, the punctures fine, ocellate, separated by about one-half their own diameters, their intervals minutely alutaceous. Elytra but slightly wider at base than thorax, sides parallel to apical third, then feebly curved to apex; striæ fine, their punctures small, close set; intervals feebly convex, each with three or four rows of minute, hair-bearing punctures. Under surface finely and sparsely punctate, the hairs of the punctures much shorter than those of elytra. Length 4.8–5.5 mm.

Described from seven specimens taken at porch light, June 12–July 11. Allied to *H. densus* Lec. but readily separated by its more slender subparallel form, wholly pale and more filiform antennæ, more shining surface and much finer sculpture of thorax and elytra. Named in honour of my daughter-in-law, Elberta H. Blatchley, of Dunedin, Fla., who has kindly collected for me this and many other interesting beetles during the summer months.

Pseudariotus amicus Casey.—One specimen, April 6. Casey described it from two specimens taken at Biscayne Bay, Fla., by Hubbard and Schwarz.

Vanonus sagax Casey.—A single example, April 6. Both this and the preceding, as well as a number of other interesting forms, as *Emelinus** *ashmeadi*, *Zonantes schwarzi*, *Sandytes ptinoides* and *Toxotropis floridanus*, have been taken only by sweeping ferns and other vegetation in Skinner's Hammock, a densely wooded, wet tract of several hundred acres located one mile northeast of Dunedin. Casey's types of *V. sagax* were from Indian River, Fla. It is known also from Crescent City.

Epicauta watsoni, sp. nov.—Elongate, subcylindrical. Black, above uniformly and densely clothed with grayish-yellow pubescence; antennæ black, legs piceous. Head with a narrow and deep median groove, its sculpture concealed; eyes large, rather coarsely granulated, not emarginate; antennæ with joints cylindrical, of equal thickness throughout, closely united, the second one-third the length of third. Thorax distinctly wider than long, sides straight, at apical third strongly obliquely convergent, hind angles obtuse; disc apparently smooth, but with punctures so minute as to be visible only under high power, and with a wide, deep, entire median groove which expands near base and apex. Elytra with sculpture concealed, their tips separately rounded. Under surface finely granulate-punctate, the pubescence less dense than that above. Length 9.5 mm.

One specimen taken on Compositæ near Gainesville, September 17, by Prof. J. R. Watson, the able entomologist of the Florida Agricultural Experiment Station, in whose honour I have given the name. Differs from all other known species of Section A of Horn in the form and sculpture of thorax. Messrs. Schwarz and Barber report that it is unlike anything in the National Museum collection and entirely unknown to them. In a manuscript "List of Coleoptera named for Mr. Chas. Johnson by John Hamilton and said to have been taken in the vicinity of St. Augustine,

*This was wrongly printed *Eleminus* on page 277 of the August No. of the Can. Entom.

Florida," which list has been loaned me by Mr. Schwarz, I find the following: "*Epicauta strigosa* and a n. sp., the female of which has the thorax smooth, impunctate, polished." It is very probable that the new species thus briefly mentioned by Dr. Hamilton is the one I have above described as *Epicauta watsonsi*.

Anthonomus scutellaris Lec.—Two specimens on March 9, by beating plum. In the "Rhynchophora of N. E. America," its southern range is given as Georgia and Texas. Bred from wild plum taken at Brookville, Fla., by P. H. Dorsett. (Schwarz Mss.)

Anthonomus elegans Lec.—On February 27 a single example of this handsome weevil was swept from the foliage of the mangrove, *Rhizophora mangle* L., on Hog Island. Known heretofore only from Haulover, Jupiter and Biscayne Bay on the east coast of Florida.

Conotrachelus serpentinus Boh.—One specimen taken March 6, by beating in the Skinner Hammock. Recorded only from Enterprise and Biscayne Bay.

Acalles granosus Lec.—Two specimens of this rare species were taken February 17 in company with *Anchonus duryi* and *Conotrachelus maritimus* beneath chunks of saw palmetto stems along the beach of Clearwater Bay; also recorded only from near the east coast.

Cryptorhynchus helvus Lec.—Of this rare species, known heretofore only by the unique type from Enterprise, Fla., I possess a single specimen kindly given me by H. L. Dozier. It was taken near Gainesville on June 26, 1916.

Sphenophorus chittendeni Blatch.—A fourth specimen of this distinct "bill-bug" was picked up December 21 from the sidewalk along the bay front at Dunedin. It evidently occurs only along or close to the sea coast.

In order to be enabled to devote all of his time to closely allied economic work in the Agricultural Department of the University of Minnesota, Professor F. L. Washburn, for fifteen years State Entomologist, has asked and obtained the consent of the Board of Regents of the University to drop the State Entomologist work, with its attendant police and quarantine duties, this change to be effective February 6th, 1918.

NEW NEARCTIC CRANE-FLIES (TIPULIDÆ, DIPTERA). PART IV.

BY CHARLES P. ALEXANDER, LAWRENCE, KANSAS.

Family *Tipulidæ*.
Sub-family *Limnobiinæ*.
Tribe *Eriopterini*.

Erioptera (Erioptera) megophthalma, sp. n.

Allied to *E. macrophthalma* Loew, *E. vespertina* O.S., etc.; coloration reddish yellow throughout; antennæ with the scape dark brown, the flagellum pale basally, passing into darker toward the tip; inner margins of the eyes broadly margined with silvery.

Male.—Length 5.5. mm.; wing 4.5–5.2 mm.

Rostrum and palpi dark brown. Antennæ with the scape dark brown, the basal flagellar segments light yellow, passing into dark brown toward the tip. Head with the front and the vertex adjoining the inner margin of the eye silvery white; remainder of head yellowish buff with an indistinct brown median line. Eyes of the male very large, contiguous across the ventral portion of the head, purplish black.

Thorax clear reddish yellow, including the pleura, not brightened on the humeral angles of the mesonotal præscutum (as in *vespertina*). Halteres pale. Legs golden yellow, the apical tarsal segments darkened. Wings with a pale grayish tinge, the veins pale, the costal region yellow.

Abdomen light reddish yellow with long, pale hairs; male hypopygium with the ninth tergite quadrangular, the apex squarely truncated, pleurites long, the dorsal appendage straight, pale, tipped with darker.

Habitat.—Northeastern United States.

Holotype.—♂, Bools Hillside, Ithaca, N. Y., reared from larva, June 3, 1917.

Allotopotype.—♀.

Paratopotypes.—25 ♂s ♀s; paratypes, ♂, Westchester Co., Tarrytown, June 9, 1914 (Frost); Fulton Co., Sacandaga Park, June 18, 1916 (Alexander); Herkimer Co., Indian Castle, June 9–13, 1915, (Alexander).

Type in the collection of the author.

Related to *E. macrophthalma* Loew (Europe). In our fauna closest to *E. vespertina* O.S. in the enlarged eyes of the male sex but differing in the clear, reddish brown coloration of the body, lacking the yellow humeral angles to the præscutum and the bright yellow knobs to the halteres. The male hypopygia are differently constructed in the two species.

E. vespertina is an inhabitant of open swamps and meadowlands, while *E. megophthalma* is characteristic of cool woods and boggy, shaded hillsides. I reared this new species from numerous larvæ, occurring in mud and beneath rotting leaves, associated with other crane-fly larvæ (as *Dicranomyia stulta*, *Molophilus hirtipennis*, *Ormosia innocens*, *Limnophila fuscovaria*, *Rhaphidolabis flaveola*, *Tipula oropezoides*, *T. collaris*, *T. cayuga*, *Bittacomorphella*, *jonesi*, etc.) in the *Symplocarpus* association on Bools Hillside. The larva is curious in the chalky white colour due to the contents of the food-canal showing through the skin; the head-capsule and spiracular-disk are very small.

Tribe *Limnophilini*.

Lasiomastix subtenuicornis, sp. n.

Allied to *L. tenuicornis* O.S.; antennæ of the male elongated; apical cells of the wings pubescent; cell M_1 of the wings lacking.

Male.—Length 7 mm.; wing 7.4 mm.

Female.—Length 8.8–9 mm.; wing 8.8 mm.

Rostrum and palpi black, the former slightly pruinose. Antennæ of the male elongated, black, the flagellar segments elongate-cylindrical with a dense, whitish pubescence. Head light gray.

Præscutum brownish gray with three broad, dark brown stripes, the median one not attaining the suture; scutum, scutellum and postnotum blackish gray pruinose. Pleura dark with a clear, blue-gray pruinosity. Halteres yellow, the knobs a little darker. Legs with the coxæ dull yellowish, the two anterior pairs a little pruinose basally on the outer faces; trochanters yellow; femora yellow, passing into brown on the outer third; tibiæ and tarsi dark brown. Wings dusky gray; stigma brownish; veins dark brown; a sparse pubescence in the apical cells of the wings. Ven-

ation: cell R_2 sessile or very short-petiolate; cell M_1 lacking by the fusion together of veins M_1 and M_2.

Abdomen dark brown, the sternites paler; female ovipositor long, brownish yellow.

Habitat.—Northeastern United States.

Holotype.—♂, Bools Hillside, Ithaca, N.Y., June 4, 1917, (Alexander).

Allotopotype.—♀.

Paratopotypes.—3 ♂s, 2 ♀s, June 4–13, 1917.

Paratype.—♂, McLean, N.Y., May 31, 1913.

Type in the collection of the author.

Readily distinguished from *L. tenuicornis* O.S., its closest ally, by the lack of cell M_1 of the wings. The usual flight-period of the species is presumably in late May and the first week of June. The season of 1917 was very cold and backward, at least two weeks late by mid-June.

Sub-family *Tipulinæ.*
Tribe *Tipulini.*

Tipula aperta, n. n. for *T. imperfecta* Alexander.

(Proc. Acad. Nat. Sci. Phila., Sept., 1915, p. 484–485) not *T. imperfecta* Brunetti (Rec. Indian Museum, vol. 9, 1913, p. 260).

Tipula sackeniana, sp. n.

Tricolor group; close to *T. tricolor* Fabr.; coloration reddish brown; male hypopygium without a pencil of reddish hairs on the sides of the caudal margin of the ninth tergite.

Male.—Length 16.8–17.5 mm.; wing 15.5 mm.

Female.—Length about 18 mm.; wing 17.5 mm.

Frontal prolongation of the head with the dorsal half pale brownish yellow, the ventral portion darker, with a dark, lateral line; palpi dark brown. Antennæ with the scape dark brown; flagellar segments light yellow, the basal enlargement brown. Vertex light gray in front and very narrowly along the inner margin of the eyes; remainder of the vertex brownish gray with a narrow, brown line; an orange spot on the sides of the vertex at the narrowest part; occiput similar in colour.

Mesonotal præscutum light gray laterally, the stripes reddish brown, narrowly margined with brown, median stripe narrowly bisected by a dark brown vitta, the interspaces dark; scutum reddish brown; scutellum and postnotum yellowish brown. Pleura brownish yellow, the posterior half, including the coxæ of the middle and hing legs, white pruinose. Halteres light brown, the knobs brown. Legs with the trochanters yellow, the fore coxæ darker; femora dark brown, the basal portion brighter, tibiæ and tarsi dark brown. Wings like those of *T. tricolor;* reddish gray, the costal region darker, a broad, pale streak in cell *M* and the anal angle paler; hyaline obliterative streak interrupted before the stigma.

Abdomen reddish yellow, the sides of the basal segments more yellowish, the terminal segments a little darker, the caudal margins of the segments very narrowly silvery. Male hypopygium with the ninth tergite produced caudally into an elongate median lobe, rounded across its tip which is darkened; no pencil of reddish bristles near the base of this lobe as in *tricolor.*

Habitat.—Eastern United States.

Holotype.—♂, Difficult Run, Virginia, July 25, 1915, (Alexander).

Allotype.—♀, Falls Church, Virginia, Sept. 26, 1915, (McAtee).

Paratopotypes.—2 ♂s; *paratype.*—♂, Beltsville, Maryland, Aug. 8, 1915, (McAtee); ♂, Stone Mt., Georgia, Aug. 3, 1913, (J. Chester Bradley); ♂, Ithaca, New York, Aug. 26, 1914, (Alexander).

Type in the collection of the author.

Similar to *T. tricolor,* but the entire body much more yellow, the thoracic stripes more reddish, the abdomen reddish yellow with the terminal tergites scarcely darkened; ninth tergite of the male without a pencil of hairs on either side of the median lobe. *T. fraterna* is smaller, the thoracic stripes brownish gray, sides of the abdominal segments broadly infuscated and the femoral tips brown.

Tipula aprilina, sp. n.

Dejecta group; closely resembling *T. dejecta* Walker, except in the male hypopygium.

Male.—Length 11–11.2 mm.; wing 11.5 mm.

Region of the ninth tergite large, the caudal margin with the lateral angles produced caudad into prominent, blunt lobes that are blackened and furnished with small tubercles, the caudal margin truncated; between the lateral lobes two parallel, usually longer and slightly pointed lobes that are directed slightly ventrad, one situated on either side of the median line; outer pleural appendage very small, inconspicuous, elongate-cylindrical, yellowish; inner pleural appendage elongate, narrow; margins of the ninth sternite not widely separated beneath, carinated with a narrow, V-shaped caudal notch; at the point of the notch a pair of small, elongate, fleshy lobes.

Habitat.—Eastern United States.

Holotype—♂, Mount Vernon, Virginia; Apr. 16, 1916, (W. L. McAtee).

Paratopotypes.—2 ♂s.

Types in the collection of the U. S. Biological Survey.

In *T. dejecta* Walker, the caudal margin of the ninth tergite bears a broad median lobe that has its posterior portion produced into two flattened, divergent horns; outer pleural appendage prominent, elongate, curved; inner pleural appendage short and broad, the ninth sternite with a broad V-shaped notch.

Tipula helderbergensis, sp. n.

Hebes group; related to *latipennis* Loew.; general colour very dark; antennal flagellum uniformly brown; male hypopygium with the eighth sternite with a dense fringe of long, golden hairs.

Male.—Length 12–13 mm.; wing 13.8–14 mm.

Female.—Length 14.5 mm.; wing 14.4 mm.

Antennæ elongated, the flagellar segments dark brown throughout. Vertex behind dark gray with a diffuse, blackish median stripe.

Præscutum light gray with three darker gray stripes, the lateral stripes margined inwardly and anteriorly with darker; median stripe broadest, margined laterally with darker, the anterior portion likewise darker, somewhat blackish; scutum grayish, more brown medially, each lobe with two dark confluent blotches; scutellum brownish yellow, a little darker medially; postnotum

brownish, the anterior half most intense. Pleura silvery white, the mesosternum and mesopleura brownish. Halteres dark brown, the knobs and extreme bases of the stems pale. Legs with the coxæ yellow, the posterior coxæ dusted with white pollen; femora dull yellow, the tips dark brown; tibiæ and tarsi yellowish brown. Wings with the usual *hebes* pattern but this very heavy.

Abdomen brownish yellow, the tergites broadly margined with paler, and submargined with a narrow brown line, palest on the basal segments, on the fourth and succeeding tergites darker and suffusing the dorsum of the segments; on the five basal tergites with a dark brown, dorso-median line that is interrupted only by the pale, caudal margins of the segments; sternites brownish yellow, margined caudally with silvery, the eighth sternite dark brown, the lateral lobes margined inwardly with a dense brush of long, golden hairs. Male hypopygium with the eighth sternite with the caudal margin deeply incised, tripartite, the lobes fringed as described above. Blade-like process not of the elongate, spiral, horn-like structure of *latipennis* but flattened, the acute tips curved strongly downwards, the ventral carina obliquely and parallelly grooved or fluted; lower process longer, straight and more pointed, the expanded basal inner portion evenly rounded, suffused with brown, not rectangular or toothed, (as in *latipennis*) upper process a prominent flatted lobe, rounded apically, the whole lobe intensely chitinized, black, not at all hatchet-shaped as in *latipennis*. In *T. hebes* the lower process is very massive and with the basal inner portion produced proximad as an acute, chitinized spine; the blade-like processes very narrow toward the tip which is feebly expanded into a spatula; the upper process bifurcate, with two chitinized arms, the outer more pointed, the inner flattened and with the apex rounded.

Habitat.—Northeastern United States.

Holotype.—♂, Indian Ladder, Helderberg Mts., Albany Co., N.Y., July 3, 1916, (Alexander).

Allotopotype.—♀.

Paratopotype.—♂; *paratype.*—♂, Wells, Hamilton Co., N.Y., July 31, 1914, (Young); in the N. Y. State Museum.

Type in the collection of the author.

Tipula huron, sp. n.

Related to *T. submaculata* Loew.; wings with a heavy brown pattern.

Male.—Length 14 mm.; wing 15.6 mm.

Frontal prolongation of the head light yellow dorsally, more infuscated on the sides below, palpi light brown, the apical segments somewhat darker. Antennæ bicolorous, the flagellar segments beyond the first with the basal enlargement black, the remainder of each segment dull yellow. Anterior part of the vertex with three linear down dashes, the median one on the frontal tubercle. Vertex dusky gray with a brown more or less interrupted median line; occiput paler.

Præscutum pale gray with three broad, dark brown stripes, the median one broadly bisected by a reddish brown line; thoracic interspaces dull, infuscated; scutum light gray, the lobes brown, scutellum and postnotum dull brownish yellow. Pleura clear, light gray, the dorso-pleural membranes more yellow. Halteres brownish, paler basally. Legs with the coxæ whitish pollinose, the anterior coxæ more pink; femora dull yellow, the tips darkened; tibiæ dull yellow, the tips very narrowly darkened; tarsi brown. Wings hyaline or sub-hyaline with the costal region more yellow; a heavy brown and gray pattern arranged about as in *T. angulata*, *T. subfasciata*, etc. The brown areas including a large basal area, a blotch at the origin of the sector, along the cord and the wing-apex, all of these marks passing into gray on the caudal cells of the wing; a broad, white fascia beyond the cord extending entirely across the wing except the extreme apex of cell M_4. Venation: vein R_2 persists for its whole length.

Abdomen dull yellow above, the tergites indistinctly ringed caudally with silvery; tergites seven and eight, and the caudal portion of six, infuscated; an interrupted sub-lateral brown line extending from the middle of tergite two to the base of tergite five; sternites dull yellow. Male hypopygium very similar to *T. submaculata*, but the lateral points of the ninth tergites in the latter species are usually shorter and less acute.

Habitat.—Nothern United States.

Holotype.—♂, Dodge Co., Wisconsin, June 5, 1910.

Type in the collection of the author.

The species is closest to *T. submaculata* Loew., but in the heavy wing pattern bears a superficial resemblance to the *angulata* and *subfasciata* groups, from both of which the structure of the hypopygium will readily distinguish it. The thoracic pattern of *submaculata* is quite different, the median stripe being dissected by a very broad, pale line.

Tipula fultonensis, sp. n.

Arctica group; related to *T. longiventris* Loew., but the abdomen of the female is about half an inch shorter than in the same sex of that species (abdomen, *fultonensis*, 16 mm.; *longiventris* 26–27 mm.).

Female.—Length 22 mm.; wing 18.5 mm.; abdomen 16 mm.

Antennæ with the apical flagellar segments indistinctly bicolorous. Head dull gray, the vertex with a narrow, brown line.

Præscutum buffy with three broad, grayish brown stripes that are broadly margined with dark brown; thoracic interspaces without brown setigerous punctures; each lobe of the scutum with a small, anterior gray spot and a larger brownish area behind; postnotum gray with a narrow, brown median line. Pleura whitish gray pruinose. Legs with the coxæ grayish; femora dull yellow, the tips very pale brown; tibiæ similar; tarsi brown. Wings with a brownish, gray pattern.

Abdominal tergites dull brownish yellow, broadly trivittate with dark brown, the lateral margins of the abdominal segments dark brown basally, gray apically, the brown sublateral stripe being very sensitive on the basal portion of each segment, sternites grayish brown; valves of the ovipositor and the dorsal shield chestnut brown, the lateral margins of the valves with about ten acute teeth; extreme tips not divergent.

Habitat.—Northeastern United States.

Holotype.—♀, Mt. Buell, Sacandaga Park, Fulton Co., N.Y., altitude 1,500 ft., June 15, 1916, (C. P. Alexander).

Type in the collection of the author.

Compared with females of *longiventris*, the present species offers the following differences: thoracic dorsum buffy brown, rather than gray; wing pattern more brown, heavier; abdomen short; ovipositor and dorsal shield chestnut brown instead of almost black, and the tips are scarcely elongate and slightly divergent.

Tipula bergrothiana, sp. n.

Arctica group; related to *centralis* Loew., but smaller and the male hypopygium different; wings of female atrophied.

Male.—Length 10.5 mm.; wing 12.2 mm.

Female.—Length 17 mm.; wing about 2 m.

Frontal prolongation of the head grayish basally, more brownish apically; palpi brown. Antennæ with the scape rather bright yellow; flagellar segments rather uniformly brown, the basal enlargement a little darker than the rest of the segments and only slightly enlarged. Head with the vertex light gray, more suffused with brown behind and on the occiput.

Mesonotal præscutum gray, the median thoracic stripe almost obliterated, lateral stripes indicated only by the narrow, bright brown margins; remainder of mesonotum gray. Pleura dull gray. Legs with the coxæ brownish gray; trochanters and femora yellowish brown, the latter a little darkened outwardly; tibiæ and tarsi slightly darker. Halteres dirty pale brown, the knobs dark brown. Wings of the male elongate, in the type crumpled and this possibly the normal condition although the venation is not distorted. Wings brown and gray with hyaline areas as in *septentrionalis* Loew., etc.

Abdomen with the first tergite and the extreme base of the second gray, the remainder of the abdominal tergites brown; a dark brown median stripe; pleural membrane distinct dark brown, simulating a lateral stripe; sternites brown, the caudal margins narrowly pale. Male hypopygium small, simple, with the ninth tergite as in *centralis*, a shiny, heavily chitinized saucer, the caudal margin feebly concave medially to receive the inner pleural appendages; each caudal lateral angle produced into an acute tooth and the margin of the saucer on either side with a smaller similar tooth beyond mid-length. Ninth pleurite complete but small; outer pleural lobe moderate in size, flattened, the inner face somewhat convex, the outer face pale brown with abundant appressed hairs; a caudal inner angle of each pleurite produced dorsad in a somewhat similar flattened lobe whose outer face is shiny and abundantly provided with erect hairs; this lobe bends dorsad and somewhat cephalad inside the outer pleural appendage; ninth sternite with a deep, V-shaped median notch, beneath the point of

which the sclerite is elevated into a transverse ridge. Eighth sternite unarmed.

The female is similar to the male but the wings are greatly atrophied, the legs, especially the femora, incrassated and the tibiæ and tarsi shortened. The abdominal tergites are brown with a broad, basal median area of black on each segment, the caudal margins brighter; lateral margins of the segments pale yellowish, sublaterally with a blackish band. Ovipositor of the *arctica* type, the ends of the valves rather blunt, the dorsal edge with four or five sharp teeth, the lateral margin with seven or eight similar but larger teeth.

Habitat.—Alaska.

Holotype.—♂, Koyukuk R., Alaska; Lat. 67–69 N.; Long. 151 W. (W. J. Peters). Summer of 1901.

Allotopotype.—♀.

Types in the collection of the U. S. National Museum.

Tipula macrolaboides, sp. n.

Macrolabis group; related to *T. macrolabis* Loew of Northeastern North America but differing in the male hypopygium, the pleural lobes unarmed at their tips; the ninth tergite with an acute median lobe, the broad, lateral lobes deeply notched to form two smaller lobes.

Male.—Length 17–17 mm.; wing 17–18.6 mm.

Close to *macrolabis* except as follows:

Antennæ of the type light brown throughout, the paratype uniform pale throughout.

Præscutum light gray with four narrow, chestnut brown stripes, the median one divided by a very broad ground vitta, pointed anteriorly; lateral stripes shorter, continued back on to the scutal lobes.

Male hypopygium with the ninth tergite extensive, with a broad and deep dorsal depression; produced caudad into a compressed median blade with a sharp dorsal edge or carina; the broad lateral lobes are deeply notched by a rounded incision to form two smaller lobules on either side, the proximal lobule longest, shiny, the lateral one with a sharp edge that is provided with a few stout bristles. Ninth pleurite complete, the caudal ventral angle produced caudad and slightly dorsad and proximad as a promi-

nent slender arm (as in *macrolabis*) this expanded on its apical half into a flattened, paddle-like blade that is unarmed.

Habitat.—Western Arctic America, south along the mountains into New Mexico.

Holotype.—♂, White Mts., N. Mex.; highest summit (11,092 ft.) Aug. 14, (C. H. T. Townsend).

Paratopotype.—♂, South Fork of Eagle Creek, Alt. 8,000 ft. Aug. 13, (C. H. T. Townsend).

Paratypes.—♂, Saldovia, Alaska, July 21, 1899, (Trevor Kincaid) Harriman Exped., 1899. Previously reported by Coquillett as *T. macrolabis* Loew.; ♂, Hudson Bay Territory (Loew. collection in the M. C. Z., part of the type-material of *macrolabis*).

Type in the collection of the U. S. National Museum.

Tipula coracina, sp. n.

Coloration black and yellow; wings whitish subhyaline; male hypopygium simple in structure.

Male.—Length 9.8 mm.; wing 11.4 mm.

Frontal prolongation of the head short, black; nasus stout. Palpi dark brownish black. Antennæ blackish brown, the flagellar segments cylindrical, not incised; verticils very short, first flagellar segment with these bristles scattered, the remaining segments having them basal in position. Head black, finely punctured. Eyes with rather coarse ommatidia.

Pronotal scutum black; scutellum bright yellow on either side of the infuscated dorso-median depression Mesonotal præscutum black, the interspaces with a few scattered paler hairs; scutum black except on the sides behind the wing-root where it is obscure yellowish; scutellum and postnotum black. Pleura dark brownish black, the extensive dorso-pleural membranes yellowish. Halteres brownish yellow. Legs with the coxæ and trochanters black; femora yellowish basally, the remainder of the legs dark brown. Wings whitish with a pale brownish tinge; stigma ill-defined, brownish; veins dark brown. Venation: R_2 short, straight; R_{2+3} longer than R_2 alone; cell M_1 open in both wings by the partial atrophy of vein M_1; cross vein M very long and prominent, inserted just beyond the fork of M on M_{3+4}.

Abdominal tergites and sternites dark brownish black, the segments broadly margined laterally and caudally with yellowish. Hypopygium simple, small; ninth tergite moderate in size; ninth

pleurite complete, elongate extending back to the eighth segment; outer pleural appendage an elongate fleshy lobe that is narrowed apically, clothed with long hairs that are directed backward; inner pleural appendage of somewhat similar structure, elongate, bearing on the inner face a small, sub-apical tooth; the surface is densely clothed with a short pubescence. Ninth sternite with a deep, V-shaped notch; eighth sternite unarmed.

Habitat.—Alaska.

Holotype.—♂, Point Barrow, Alaska, July 8, 1882 (John Murdock).

Type in the collection of the U. S. National Museum.

OBITUARY NOTICE.

WILLIAM D. KEARFOTT.

Canadian students of Lepidoptera will regret to record the death of William D. Kearfott, of Montclair, N.J., which occurred on November 12th, 1917, following an attack of apoplexy. Born in Berkeley County, West Virginia, on January 12th, 1864, he was thus, comparatively, a young man. We learn from Entomological News, January, 1918, that he was educated in primary schools in Richmond and Philadelphia. In his earlier years he was connected with the Morton Poole Company, of Wilmington, Delaware, and the International Navigation Company, of Philadelphia. He was associated also with the Worthington Steam Pump Company. Two years ago he formed the Kearfott Engineering Company. He was considered an authority on his branch of engineering.

Kearfott was a keen student of the Micro-lepidoptera, particularly of the family Tortricidæ, and was specially interested in Canadian species. During the years 1903 to 1908 he built up a large correspondence with collectors throughout Canada and, as a result, brought together a most important collection, particularly of the family mentioned. He was an exceedingly bright correspondent and ever ready to help us in the determination of specimens in the groups in which he specialized. Of late years, however, his eyes gave him considerable trouble, and he found it necessary to give up the study of the small moths he loved so well. His collection of Tortricidæ, which was particularly rich in Canadian material, is now in the American Museum of Natural History. His Pyralidæ is in the Barnes' collection.

Among the important papers which he published, those which relate to Canadian species are the following:

New North American Tortricidæ: Trans. Amer. Ent. Soc. XXXIII, 1—Twenty species from Canada described.

New Tortricids from Kaslo, B.C., and the Northwest: Can. Ent., XXXVI, 109, 137—Six species from Canada described.

A New Proteopteryx: Can. Ent. XXXVI, 306—Description of *P. willingana*, from Regina, Sask.

Coleophora tiliæfoliella Clem.: Can. Ent. XXXVI, 324—Description of adult found at Ottawa.

New Tortricids: Can. Ent. XXXVII, 9—Three Canadian species described.

A New Gelechid from Ontario: Can. Ent. XXXVII, 15—Description of *Aristotelia youngella* from Ottawa.

Assiniboia Micro-lepidoptera, Collected by Mr. T. N. Willing: Can. Ent. XXXVII, 41, 89, 119—Seven new species described.

Manitoba Micro-lepidoptera: Can. Ent. XXXVII, 205, 253, 293—A list of species taken chiefly at Aweme, Cartwright and Rounthwaite.

New Micro-lepidoptera: Can. Ent. XXXIX, 1, 53, 77, 121, 153, 211—Thirty species from Canada described.

New North American Tortricidæ and Tineina: Jour. N.Y. Ent. Soc. XVI, 167—Six species from Canada described.

In the above papers it will be seen that 69 new species from Canada are described. In these articles, in many instances, valuable larval notes are also included. His last paper published in this journal, entitled "A New Species of Japanese Micro-lepidoptera," appeared in October, 1910.

His business life was an exceedingly busy one, and it is remarkable that he was able to accomplish so much valuable systematic work. In one of his letters he told the writer that his business required nearly eleven hours' work a day.

In June, 1907, Mr. Kearfott paid a week's visit to Ottawa, and during that period the writer, Dr. Fletcher and Mr. C. H. Young, had many happy hours together at Meach Lake, Que., the Mer Bleue, and other attractive collecting spots near Ottawa. We all enjoyed Kearfott's bright, jovial company during this visit, and Mr. Young and the writer, the remaining two of the above quartette, will long remember the pleasant outings we had together.

Mr. Kearfott is survived by his wife, one son and one daughter.

ARTHUR GIBSON.

Mailed February 8th, 1918.

The Canadian Entomologist.

VOL. L. LONDON, MARCH, 1918 No. 3

POPULAR AND PRACTICAL ENTOMOLOGY.

LIGHT TRAPS AS A MEANS OF CONTROLLING INSECT PESTS.

BY NORMAN CRIDDLE, DOMINION ENTOMOLOGICAL LABORATORY, TREESBANK, MAN.

Collecting at light, as it is popularly termed, has been a favourite method of securing certain kinds of insects, almost since the time when collecting was in its infancy, and that insects were so attracted was probably known before entomology, as we know it, was even dreamed of. We might, in fact, suspect it of being as ancient as the knowledge of fire itself. While the collector, however, has used this knowledge to procure specimens for his cabinet; it is only within recent years that attention has been called to the possible use of light traps as a means of controlling certain insect pests. On the face of it, what seemed easier? Moths and beetles, too, were known to dash themselves against the light, at times, in vast numbers. All that had to be done, then, was to place light traps at convenient distances apart and provide means for the destruction of the attracted insects. Indeed, a bonfire occasionally replenished would answer every purpose. The method was, in fact, a repetition of the candle and the clothes moth on a large scale. Yes, on the face of it there was certainly promise of success, but, alas, even a casual investigation soon brought other things to light. It was seen at once that the advocates of light traps had overlooked several important details and one important fact which in itself was sufficient to make the whole idea abortive. To begin with, insects are only attracted to bright light in comparatively limited numbers even under the most favourable weather conditions, among which may be mentioned warmth and cloudiness. A perfect night must combine these at a time when the moon is below the horizon or not visible, and provide, in addition, a stormy atmosphere with preferably a light rain falling. Such conditions occur but rarely, so much so, in fact, that they have been absent during the last three years. Thus, meteorological conditions alone, will often materially affect the value of

such means of controlling insect pests. A far more important consideration has to do with the proportion of males and females secured by light traps. Take *Feltia venerabilis* for instance; this is one of our commonest cutworm moths which is freely attracted to light, yet of the 192 specimens so secured all were males. Other species, with few exceptions, show very similar results. The Red-backed cutworm (*Euxoa ochrogaster*), while enticed to light on favourable occasions, was entirely absent during the three years experiments were carried on, though examples were secured close at hand at the time and larvæ had previously been very destructive. The proportion of hymenopterous parasites taken at light is also an important factor to be reckoned with. Lastly, we have to take into consideration the fact that at least some of the female moths collected will have already deposited a proportion of their eggs.

Below is given a table showing the records of captures for August and September for three years past—ending 1917. The collections of individual nights have been lumped for convenience. Two traps were used in the work, one of the usual search-light pattern, and the other a trap devised by my brother Stuart in which three sides were exposed to the light. These traps were placed in different localities where cutworms were known to have occurred. They were put out on practically every suitable night during the three seasons. The July results were too small to make them worth recording.

	August		September		
Name of Species	Males	Females	Males	Females	Total
Euxoa quadridentata G. & R.	52		166	14	232
" *ridingsiana* Grt.	70		23	95	188
" *detersa* race *personata* Morr.	74	4	60	16	154
" *exculta* race *criddlei* Sm.			7	3	10
" *velleripennis* Grt.	14		8		22
" *tessellata* Harris	25	2	12	6	45
" *albipennis* race *matis* Sm.	12		5	1	18
" *redimicula* Morr.	18	3	1	1	23
Feltia rubustior Sm.	10		1		11
" *venerabilis* Wlk.	23		169		192
" *ducens* Wlk.	370	40	17		427
Agrotis collaris G. & R.			4	1	5
Lycophotia scandens Riley	7		16	1	24
Sidemia devistator Brace	13	6	1	1	21
Tipulid flies	2		5	3	10
Ichneumonid flies	281	6	692	27	1,006
Braconid flies		46		77 Sexes	123
Other Hymenopterous parasites		29		5 not	34
Tachinid flies		2		4 ascer-	6
Lace-winged flies				7 tained	7
Total moths collected	688	55	490	139	1,372
Total useful insects		364		812	1,176

Micro-lepidoptera, comparatively harmless. Macros and numerous small insects of doubtful economic value are not included, though collected in considerable numbers.

Comparing the August catch with that of September it will be observed that there is generally an increase in the proportion of females in the latter month and a falling off in the males. This is doubtless due to the males being more active soon after emerging whereas the females become more so at the period of egg-laying. It will be noted further that the total number of moths collected only exceeds the number of useful insects taken by 196 specimens, or including the tipulid flies, 206.

Another point to be considered is that while the moths included in this table are all the parents of cutworm-like caterpillars by no means all are recognized as of economic importance. Thus we might reasonably leave out *Euxoa ridingsiana*, *quadridentata*, *criddlei*, *redimicula* and *Feltia robustior*.

Male insects seem to greatly exceed the females in nearly all orders attracted to lights, and the species of Ichneumonid flies are no exception to this rule. The Braconid flies, however, show a greater proportion of females attracted though males still predominate.

With reference to the destruction of June-beetles (*Lachnosterna* spp.) by means of light traps, the writer conducted a number of experiments relating to this subject in 1914, and it was found that while male beetles could be secured in considerable numbers, females were apparently only caught by accident, at least they did not constitute more than one per cent. of the total catch. As a matter of fact the females are far less active than the males and seem to be more concerned with feeding than flying about.

The facts brought out by this investigation seem to bear out very clearly the conclusions arrived at by other investigators, namely, that light traps are not a practical method of controlling insect pests, and that the number of noxious insects destroyed by this means is infinitesimal in any case. Moreover, when we take into consideration the useful insects secured at the same time we are left in doubt as to whether this method does not actually do more harm than good. There may be a time when certain pests, at present not thought of, may be controlled by means of artificial

lights. In the meantime, however, we must rely upon such remedies as tests have proved worthy of recommendation.*

A PARTIAL KEY TO SPECIES OF THE GENUS AGROMYZA (DIPTERA).

BY J. R. MALLOCH, URBANA, ILL.

It is my intention to publish keys to species groups of the genus Agromyza as aids to the identification of the numerous forms which have been described or recorded from North America. Up to the present time I have seen nearly ninety species of the genus from the United States. In order to make it possible for a serial magazine to present keys to this large number of forms I have divided the genus into arbitrary groups, the characters used in these divisions being enumerated in each instalment on the key.

The present key includes all species which have the *scutellum conspicuously yellow* either entirely or in part, *contrasting strikingly with the disc of the thorax*. The halteres in all the species are pale

1. Antennæ with at least the entire third joint black (cf. *variata*).....2
   Antennæ entirely yellow or at most with the third joint partly infuscated.....5
2. Frons black, only frontal lunule yellow. Food-plant unknown. Mexico; New Mexico.....*xanthophora* Schiner.
   Orbits black, interfrontalia reddish yellow; very small species (.75 mm.); body with exception of scutellum black; legs black, only knees yellow. Food-plant unknown. Wash.; Ill.....*interfrontalis* Melander.
   Frons yellow, ocellar region and sometimes orbits partly black; body with more than scutellum yellow.....3
3. Palpi and legs black. Food-plant unknown. Texas.....*quadrisetosa* Malloch.
   Palpi and greater portion of legs yellow.....4
4. Wings clear. Food-plant unknown. Wash.; Alaska; B.C.; Ill.....(*longispinosa* Malloch) *pacifica* Melander.

*For further reference on this subject see Stingerland's "Trap-lanterns or Moth-catchers." Bull. No. 202, Ithaca, N.Y., 1902.

Wings with a conspicuous infuscation along costa from apex of first vein to apex of second. Food-plant unknown. Ill.....*fumicosta* Malloch.

5. Mesonotum with the disc broadly black, the yellow of the lateral margins not carried entirely across on posterior margin.....6

Mesonotum with a large black or reddish mark on disc, the yellow of lateral margins connected along posterior margin, and usually a large subtriangular or subquadrate yellow mark on middle of posterior portion of disc.....10

6. Mesonotum with disc bare except for the dorso-central bristles.....7

Mesonotum with numerous short setulose hairs on disc in addition to the dorso-central bristles.....8

7. Mesonotum with 2 pairs of dorso-central bristles; cheek nearly as high as eye; last section of fifth vein twice as long as penultimate section. Food-plant unknown. Idaho.....*lima* Melander.

Mesonotum with 4 pairs of dorso-central bristles; cheek about one-third as high as eye; last section of fifth vein four times as long as penultimate section. Food-plant unknown. Arizona.....*discalis* Malloch.

8. Orbits glossy black; antennæ very small; pleuræ and abdomen almost entirely glossy black. Food-plant unknown. Ill.....*deceptiva*, sp. n.

Orbits yellow; antennæ of moderate size; pleuræ and abdomen largely yellow.....9

9 Small species, .75–1.5 mm. in length; last section of fifth vein 2½–3 times as long as penultimate section. Larvæ in serpentine mines in leaves of various legumes, cabbage, cotton, nasturtium, etc. U. S.; Canada; Europe.....*pusilla* Meigen.

Larger species, 2–2.5 mm. in length; last section of fifth vein 1½–2 times as long as penultimate section. Food-plant unknown. Cal.; Arizona; Europe.....*scutellata* Fallen.

10. Third antennal joint largely blackened; palpi blackened at apices. Food-plant unknown. Maine; Ill.....*variata* Malloch.

Third antennal joint and palpi not blackened, rarely the former brownish at insertion of arista.....11

11. At least 4 more or less regular rows of setulose hairs between the dorso-central bristles on mesonotum.....12
At most 2 irregular rows of setulose hairs between dorso-centrals on disc of mesonotum.....16

12. Mesonotum with the discal black marking opaque. Food-plant unknown. B. C.....*borealis* Malloch.
Mesonotum with the discal mark either reddish or entirely glossy black.....13

13. Cheek posteriorly about half as high as eye; arista almost bare. Food-plant unknown. N.M.....*flavonigra* Coquillett
Cheek posteriorly less than half as high as eye; arista pubescent.....14

14. No posterior setulæ on mid-tibiæ; posterior margin of mesonotum with a broad, yellow band which is not anteriorly dilated centrally. Larvæ mine leaves of walking-leaf fern. N. Y.; Ill.....*felti* Malloch.
Each mid-tibia with 2 distinct setulæ; posterior margin of mesonotum with a large subquadrate yellow mark in center.....15

15. Mesonotum with discal marks entirely black. Larvæ mine leaves of *Plantago major*. U. S.; Canada; Europe.....*melampyga* Loew.
Mesonotum with discal mark largely reddish, only posterior extremities and lateral margins black. Larvæ mining in *Paspalum*. S. C.; Ill.....*marginalis* Malloch*.

16. Third antennal joint larger than normal in this group, the upper margin sharply angulated at apex. Food-plant unknown. Ill.....*angulicornis*, sp. n.
Third antennal joint small, rounded at apex. Food-plant unknown. Ill.....*assimilis*, sp. n.

Agromyza deceptiva, sp. n.

Female.—Glossy black, with reddish yellow and lemon-yellow markings. Occiput, ocellar triangle, and frontal orbits glossy black; frontal stripe, antennæ, and upper portion of face reddish yellow; cheeks yellow, with a narrow, black margin; proboscis

*Originally described as a variety of *melampyga* Loew.

and palpi yellow; arista blackish. Scutellum except at base on each side, and a large, subquadrate area on margin of mesonotum between base of wing and humerus lemon-yellow. Abdomen entirely glossy black. Legs black, femora lemon-yellow. Wings slightly brownish-tinged, especially on anterior half. Squamæ with margins and fringes blackish. Halteres cream-coloured.

Head large, viewed in profile the face is distinctly retracted below, orbits clearly differentiated from central stripe, each about half as wide as latter; orbital bristles 5 in number, long and slender; cheek twice as high posteriorly as anteriorly. Mesonotum with 4 pairs of dorso-centrals, the anterior 2 pairs very weak; discal thoracic setulæ numerous and rather long; scutellum with 4 long marginal bristles. Abdomen short and broad; ovipositor conical but not tubular. Legs stout; mid-tibia without posterior setulæ. Costa to apex of fourth vein, the latter ending in apex of wing; inner cross-vein below apex of first and at middle of discal cell; last section of fifth vein about 1.5 as long as preceding section.

Length 2 mm.

Type locality, Alto Pass, Ill., May 8, 1917 (J. R. Malloch).

This species bears a strong resemblance to *quadrisetosa* Malloch, but may be readily separated from that species by the colour of the legs, palpi and antennæ.

Agromyza angulicornis, sp. n.

Male.—Yellow, slightly shining, conspicuously marked with black. Head yellow; ocellar region, greater portion of occiput, clypeus, and arista black or blackish. Dorsum of mesonotum with a black mark similar to that on *melampyga*, the yellow prescutellar mark subquadrate; disc slightly pruinose; the following parts each with a black spot—humerus, propleura, mesopleura, pteropleura, sternopleura, and hypopleura; scutellum with a black spot on each side, postnotum black except on upper margin. Abdomen infuscated on dorsum; hypopygium glossy black. Legs yellow, tibiæ and tarsi black. Wings slightly grayish, veins dark brown. Halteres yellow.

Anterior ocellus situated further proximad of posterior pair than it is in *pusilla* and allied species, the sides of the triangle being unequal; frons narrowed anteriorly, its anterior width being distinctly less than half that of head; antennæ larger than usual

in the *melampyga* group, the third joint distinctly angulated above at apex; arista microscopically haired; cheek anteriorly as high as width of third antennal joint. Mesonotum with 4 pairs of dorso-centrals, the disc bare except for a few setulose hairs arranged in 2 irregular rows between the dorso-central series and another in line with the latter. Femora rather stout. Wing venation similar to that of *melampyga*, differing in having the third and fourth veins subparallel from middle of their last sections to apices; inner cross-vein one-third from apex of discal cell; last section of fifth vein nearly 3 times as long as preceding section.

Length 1 mm.

Type locality, Waukegan, Ill., August 25, 1917, (J. R. Malloch). Taken on shore of Lake Michigan. Food-plant unknown.

This species resembles *pusilla* Meigen, but differs from it in having fewer fine hairs on disc of mesonotum and in having the prescutellar yellow mark. From all species known to me it differs in having the third antennal joint angular at apex above.

Agromyza assimilis, sp. n.

Male.—In colour this differs from the preceding species in having the tibiæ and tarsi yellow, indistinctly clouded with fuscous, and the yellow prescutellar mark on mesonotum triangular, its anterior extremity being pointed.

Structurally the principal differences lie in the shape of the third joint of the antennæ, which is considerably smaller and disc-like, in the position of the ocelli, which are in an equilateral triangle, and in the venation, the third and fourth veins being gradually divergent throughout the entire length of their apical sections. The dorsum of the mesonotum has even fewer short hairs than that of *angulicornis*, but a single irregular series appearing between the dorse-centrals.

Length 1 mm.

Type locality, Freeport, Ill., July 4, 1917, (J. R. Malloch). Food-plant unknown.

This species strongly resembles *pusilla* Meigen, but differs in having the disc of mesonotum with fewer short hairs between the dorso-centrals, and a conspicuous, triangular yellow mark on posterior margin.

SUPPLEMENTARY NOTE ON THE ANTHOMYIID GENUS PHYLLOGASTER (DIPTERA).

BY J. R. MALLOCH, URBANA, ILL.

Since sending my paper, on the genus *Phyllogaster*, which appeared in Can. Ent., XLIX, p. 227–228, 1917, I have read C. W. Johnson's paper in the April number of the same volume, in which he describes a new species of this genus under the name *robustus*. An examination of paratypes of *robustus* discloses the fact that in addition to the difference in size between the species and *cordyluroides* the male may readily be separated from the latter and also from *littoralis* by the presence of a large number of strong bristles on the basal dorsal segment of the hypopygium (two in the others) and the much larger pulvilli which exceed in length that of the apical tarsal joint, whereas in the others they are much shorter than it. The female of *robustus* has two thorns on apical abdominal segment, *littoralis* has four, the female of *cordyluroides* is unknown to me. As in *cordyluroides* the third vein of the wing is bare in *robustus*.

THE GENUS HADRONEMA UHL. (MIRIDÆ; HETEROPTERA.)

BY EDMUND H. GIBSON, U. S. BUREAU OF ENTOMOLOGY.

The flower bugs of the genus *Hadronema* Uhl. constitute an interesting little group closely allied to the genus *Lopedia* Uhl. species of which are known to most collectors of insects, such as the common Phlox bug. Those of *Hadronema* may be distinguished from the species of *Lopedia* by the fact that the base of the vertex is strongly carinate across its whole width.

Most of the species are of western occurrence, though, *militaris* Uhl., the haplotype of the genus, is distributed over the entire United States and Southern Canada. Little is known of the economic importance of the species, and in all probability they are but little restricted in food preferences.

The genus belongs to the division *Lopediaria* Van D. of the tribe *Orthotylini* Van D. and was characterized by Uhler as follows: Aspect of *Lopus*, cranium somewhat convex, face almost vertical, eyes prominent, oval, almost vertical; occiput with a

high, transverse carina between the eyes; tylus a little prominent narrowing towards the tip; cheeks short and blunt; bucculæ narrow, shorter than the basal joint of the rostrum; that joint subcylindrical, robust, a little longer than the head. Antennæ short, about as long as the corium and cuneus united, stout; the third and fourth joints of nearly equal thickness, not tapering to a setaceous termination; the latter less than one-half the length of the preceding. Pronotum trapezoidal; the angles rounded; the collum forming an obtuse, narrow collar, and behind it is an arcuated carina abbreviated a little way from the lateral margins; the lateral edges prominently carinated. Costal margins of the hemelytra almost straight, parallel.

Hadronema was described by Uhler in 1872 in the Rep. of the U. S. Geol. Survey, page 412. The genus now contains 7 species, two of which are herein described as new.

KEY TO THE SPECIES.

1. Third joint of antennæ distinctly shorter than second.....3
   Third joint equal to or longer than second.....2

2. Third joint of antennæ slightly longer than second.....*festiva* Van D.
   Third joint about equal in length to the second.....*picta* Uhl.

3. Pronotum red or with red markings.....4
   Pronotum black or gray, devoid of any red markings.....*splendida* n. sp.

4. Costal margin of corium and cuneus broadly bordered with white or cream.....*militaris* Uhl.
   Costal margin of corium and cuneus very narrowly if at all, bordered with white or cream.....5

5. Basal joint of antennæ comparatively long and slender, a distinct light spot at anterior margin of cuneus.....*princeps* Uhl.
   Basal joint of antennæ comparatively short and stout, no distinct light spot on cuneus.....6

6. Anterior margin of pronotum slightly sinuate.....*robustus* Uhl.
   Anterior margin of pronotum not at all sinuate.....*confraterna* n. sp.,

Hadronema militaris Uhl.

Hadronema militaris Uhler, Rept. U. S. Geol. Surv., p. 412 1872.

The largest member of the genus. Elytra black with wide, light coloured costal borders.

Distributed over the entire United States and Southern Canada.

Hadronema robusta Uhl.

Hadronema robusta Uhler, Proc. Cal. Acad. Sci., ser. 2, vol. IV, p. 250, 1894.

Distinguished by the bright red pronotum and scutellum and lack of colour marking on cuneus. Occurs from Kansas to Texas and west to the Pacific Coast.

Hadronema confraterna, n. sp.

General form of *robusta* Uhl., slightly shorter and more narrow. Head nearly vertical, strongly convex. First joint of antennæ comparatively short and stout, third joint distinctly shorter than the second. Antennæ black, head black except for border next to and under the eyes red, cheeks red, bucculæ whitish, rostrum dark red. Pronotum red with large black collosities, deeply depressed anteriorly at the middle, anterior border of pronotum convex, posterior border sinuate at the middle. Pronotum much broader than long, and much wider posteriorly. Scutellum very dark wider than long. Elytra red becoming dark towards inner margins, no markings on cuneus. Membrane smoky. Legs dark red to black. Abdomen red along borders, whitish below. Plate dark red or black. Size 4.2 mm. long, 1.2 mm. wide.

Distinguished from *robusta* by the shape of the anterior margin of pronotum, the larger callosities, and colouring, especially of the elytra and scutellum.

Described from a single male specimen from Las Cruces, N.M. Taken on Bigelovia. Type in the U. S. National Museum.

Describing a species from a single specimen is here warranted, although it is diverging from good practice.

Hadronema princeps Uhl.

Hadronema princeps Uhler, Proc. Calif. Acad. Sci., ser. 2, vol. IV, 1894.

A much narrower form than the other species with usually a distinct light mark on the cuneus. Occurs throughout the West.

Hadronema picta Uhl.

Hadronema picta Uhler, Colo. Exp. Sta. Bull. No. 31, p. 31, 1895.

Separable from the other species in having the second and third joints of the antennæ equal in length. Recorded as occurring in Colorado and Dakota.

Hadronema festiva Van D.

Hadronema festiva Van Duzee, Trans. Am. Ent. Soc., vol. XXXVI, No. 2, p. 80, 1910.

The only species of the genus having the third joint of the antennæ longer than the second. Also readily distinguishable by the radically different colour markings.

Mr. Van Duzee records its occurrence in New Mexico.

Hadronema splendida, n. sp.

Resembles *festiva* Van D. Head small, vertical, black with light markings next to eyes, near base of head, on the centre of the face, and below the antennæ. Bucculæ bordered with white. Antennæ black, third joint noticeably shorter than second. Pronotum dark gray or black, callosities black, anterior border of pronotum light. Scutellum red. Elytra greenish white, smoky at middle of corium, clavus smoky along inner margin, cuneus white except smoky at apex. Costal border of elytra whitish. Membrane smoky. Abdomen dark beneath but light at the middle. Femora bright orange red, tibia and tarsi black. Size 3.8 mm. long, 1.2 mm. wide.

Described from a female collected at Albuquerque, N.M., Aug., 1909, now in the U. S. National Museum.

The peculiar colour markings readily separate this species from all others.

A NOTE ON THE OCCURRENCE OF ABDOMINAL SPIRACLES IN THE COCCIDÆ. (HEMIPTERA).

BY G. F. FERRIS, STANFORD UNIVERSITY, CALIFORNIA.

Abdominal spiracles have been noted in but a limited number of species of Coccidæ and when noted seem usually either to have been passed over as of no particular significance or to have been regarded as evidence that the forms possessing them are merely aberrant. Savage, (1) who has described the tracheal system of *Monophlebus stebbingi* var. *octocaudata* Green, seems to have believed that the abdominal spiracles in this species are an adaptation to meet the needs occasioned by the extraordinarily large size of this particular insect. In a few cases they have been regarded as of some taxonomic significance. The genus *Perissopneumon* Newstead was based partially upon the fact of their presence and they are noted among the generic characters of the genera *Stigmacoccus* Hempel and *Cryptokermes* Hempel, while Pergande based his sub-family Xylococcinæ partially upon them, stating (2) that, "In the true Monophlebinæ the abdominal stigmata are wanting or not observable; . . ." .

Newstead (3) stated in 1901 that abdominal spiracles are present in *Stigmacoccus* and *Perissopneumon*, but that, . . this peculiarity does not exist in any other Coccid," and Savage (ref. cit.) repeated this statement in 1914. As a matter of fact it was erroneous when first made for such spiracles had been recorded in the case of *Cryptokermes brasiliensis* Hempel which was described in the same paper as was *Stigmacoccus*, in the case of *Xylococcus betulæ* Perg. and also in some of Maskell's species of *Cœlostomidia* (=*Cœlostoma*). In 1903 Newstead (4) recorded the discovery of abdominal spiracles in certain species of *Orthezia*, stating that, "The presence of abdominal spiracles in the three species of *Orthezia* hereafter described is a marked characteristic, and one which has not hitherto been observed in this sub-family of Coccidæ." Here he was again in error, for the abdominal

(1) Savage, R. E. The tracheal system of Monophlebus stebbingi var. octocaudata. *In* Bul. Ent. Res. 5: 45–7: pls. 5–9. (1914).

(2) Pergande, T. Bul. 18, u.s., U. S. Dept. Agric., Div. Ent., p. 26. (1898).

(3) Newstead, R. Mon. Brit. Coccidæ, vol. 1 : 15. (1901).

(4) Newstead, R. Mon. Brit. Coccidæ, vol. 2 : 227. (1903).

spiracles of *Orthezia cataphracta* (Shaw), one of the three species discussed by him, had been noted by List (5) in 1887 in an exhaustive paper dealing with the anatomy of this species. However, Newstead does, indeed, appear to have been the first to note their presence in any other species of this genus.

As far as I am at present able to determine the following list includes at least the genera in which abdominal spiracles have been noted, although it probably does not include all the species, some descriptions not being accessible. In the subfamily Monophlebinæ there are recorded the genera *Stigmacoccus* with one species, *Perissopneumon* (perhaps not a synonym of *Stigmacoccus* as it has been regarded) with two species, and one species of *Monophlebus*. In the Margarodinæ there are the genera *Xylococcus* with four species, *Steingelia* with two, *Stomacoccus* with one, some of the species of *Margarodes*, and at least two of *Cœlostomidia*. In the Dactylopiinæ there is but the monotypic genus *Cryptokermes*. In the Ortheziinæ there are three species of *Orthezia*.

On the face of these records it would appear that the presence of abdominal spiracles has indeed but little significance and their occurrence might well be taken as evidence of aberrancy, the more so as most of the species in which they are recorded are curious enough in other respects as well. However, an examination of even the limited number of species available to me for study has shown that these records are extremely misleading. In short, abdominal spiracles are present in several forms in which they have not been noted and are in all probability present in many others.

The most surprising fact is that they appear to have been overlooked in such a well known species as *Icerya purchasi* Maskell, as well as in at least two other species of this genus. In *I. purchasi* Maskell two pairs are present, while in *I. seychellarum* (Westw.) and *I. aegyptiaca* (Dougl.) there are at least three. The original description of *I. jacobsoni* Green is not available and I do not know if they have been noted in this species, but in specimens from the Philippine Ids. (det. Cockerell) there are at least two pairs. In all these species the spiracles are situated toward the posterior

(5) List, J. H. Orthezia cataphracta Shaw. *In* Arbeiten á. d. zool. Inst. zu Gratz, 1 : 5 : 201–278 : pl. 1–6. (1887).

end of the abdomen. It is, perhaps, after all, not so surprising that they have not been observed for they are quite small and difficult to find among the many pores, spines and cicatrices, even in well stained preparations, but that they are really spiracles has been clearly demonstrated for it is possible to see the tracheæ proceeding from them.

Three other species belonging to the Monophlebinæ are at hand, these including *Paleococcus plucheæ* (Ckll.), *Drosicha burmeisteri* (Westw.), (det. Kuwana) and *Drosicha corpulenta* (Kuwana), and in none of these have abdominal spiracles been recorded. My single specimen of *Paleococcus plucheæ* (Ckll.) shows at least one pair but is in too poor condition to decide whether or not there are more. Both the species of *Drosicha* show seven clearly distinguishable pairs.

Of the species of Margarodinæ in which these spiracles have not been noted there are at hand specimens of *Kuwania quercus* (Kuwana) and *Kuwania* (?) *zeylanica* (Green). In the former there appear to be but four pairs, these being on the anterior segments, and in the latter there are eight, of which the posterior two are so much reduced as to amount to but little more than points of attachment for the tracheæ.

In the Ortheziinæ abdominal spiracles have been seen only in the three species noted by Newstead, *O insignis* (Dougl.), *O. cataphracta* (Shaw) and *O. urticæ* (Linn) but they are present in *O. californica* Ehrh., *O. galapagoensis* Kuwana and in an undetermined species of which I have specimens. In *O. californica* I note seven pairs, but in the other two species examined by me the material is in too poor condition to permit conclusions as to the real number. Newstead apparently does not state the number in the species examined by him, but List has recorded seven pairs in *O. cataphracta* (Shaw). Newstead states that he has not been able to trace them in *Newsteadia floccosa* (De Geer), nor have I been able to find them in *Nipponorthezia ardisiæ* Kuwana.

The monotypic genus *Cryptokermes* Hempel, which possesses abdominal spiracles, forms an extremely discordant element even in such an aggregation of disharmonies as the subfamily Dactylopiinæ (of the Fernald Catalogue) to which it is now referred. Specimens of *C. brasiliensis* Hempel, (Mexico, det. Cockerell) are

at hand and are sufficient to show that the species has been thoroughly misunderstood and that it cannot be referred to this subfamily. It is, in fact, a member of that group, whatever it may eventually be called, that includes the present subfamilies Monophlebinæ and Margarodinæ, although it cannot be referred to either of these groups as they are at present defined for it seems to combine the characters of both. I shall discuss the species at some length in a later note.

The facts here presented are too few to permit of any very sweeping generalities, yet they are suggestive enough and I present them at this time, in spite of their fragmentary character, in order to call attention to them and to their possible significance.

It will be noted that, with the exception of the species of *Orthezia*, all the forms in which these spiracles have been noted belong to the two subfamilies Monophlebinæ and Margarodinæ. Conversely, it is possible, if indeed not probable, that all the members of these groups will eventually be found to possess such organs. It, therefore, appears that we may have available a taxonomic element that has not been fully utilized and that may throw a considerable amount of light upon the relationships of these forms. Whether or not the presence of abdominal spiracles is any evidence of a close relationship between the Ortheziinæ and the other two subfamilies remains to be seen, but there is some other evidence that the present division between the Monophlebinæ and the Margarodinæ is by no means as clear as it has been thought.

The Board of Regents of the University of Minnesota at their meeting on January 18th elected Dr. W. A. Riley, of Cornell, Professor of Parasitology and Chief of the Division of Economic Zoology. Associate Professor A. G. Ruggles was, at the same time, appointed Station Entomologist, which position carries with it the office of State Entomologist. At the December meeting of the Board Professor F. L. Washburn, who has held the position of State Entomologist in Minnesota for nearly sixteen years, asked and obtained permission to be relieved of that position and its attendant police duties, and the action of the Board on the 18th was necessary to fill the vacancy thus caused.

APHIS SALICETI (KALTENBACH), SIPHOCORYNE PASTINACÆ (LINN.), AND ALLIED SPECIES.

BY C. P. GILLETTE AND L. C. BRAGG, FORT COLLINS, COL.

It is the object of the authors of this paper to give the results of their studies on a half dozen species of aphides that are quite similar in general appearance, and all but one of which have the willows for their winter hosts, in the hope that they will clear away some confusion and prevent further mixing of data. We believe we have the structural characteristics and food habits well enough worked out so that these species may be readily separated, whether from their winter or summer hosts, by use of the following simple key:

Cornicles cylindrical or slightly tapering.

Pre-caudal spine on dorsum of 8th abdominal segment.....*Aphis theobaldi*, n. sp.

No pre-caudal spine on 8th abdominal segment..*Aphis saliceti*.

Cornicles distinctly clavate.

With pre-caudal spine on 8th abdominal segment,

Joints 4, 5, 6 and spur sub-equal.....*Siphocoryne capreæ*.

Spur equal to joints 4, 5 and 6 combined.....*Siphocoryne essigi*, n. sp.

Without pre-caudal spine on 8th abdominal segment,

Antenna shorter than the body.....*Siphocoryne pastinacæ*.

Antenna longer than the body.....*Siphocoryne grabhami*.

In order that others interested in these species may look up the literature readily, we are giving references to the more important papers:

Aphis saliceti Kaltenbach.

Aphis saliceti, Monographie der Fam. der Pflanzenläuse, p. 103, 1843.

Koch, Die Pflanzenläuse, p. 118, 1857.

Buckton, Monograph of British Aphides, vol. II, p. 52, 1879.

Siphonophora salicicola, n. sp., Thomas, Bul. 2, III, St. Lab. Nat. Hist., p. 8, 1878.

Aphis salicicola, Monell, Bul. 5, U. S. Geol. Surv., p. 24, 1879.

Oestlund, Aphididæ of Minn., p. 63, 1887.

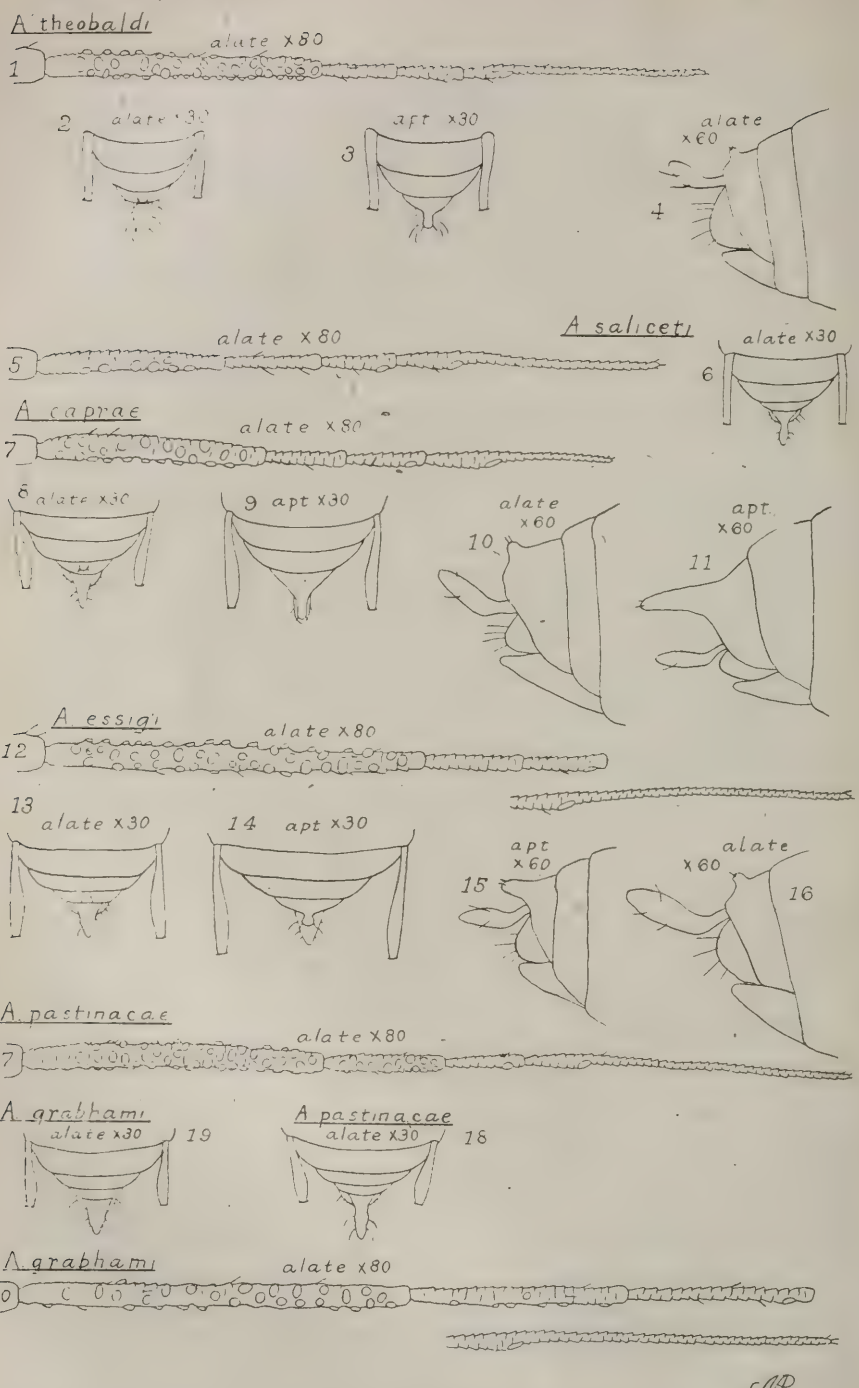

Figure 1—4, *Aphis theobaldi*; 5—6, *A. saliceti*; 7—11, *Siphocoryne capreae*; 12—16, *S. essigi*, n. sp.; 17—18, *S. pastinacae*; 19—20, *S. grabhami*. Original, Miriam A. Palmer Delineator.

Aphis salicola, Cowen, Hemip. of Colo., Bul. 31, p. 121, 1895.
Morgan, Jour. Exp. Zool., vol. VII, p. 301, 1909.
Aphis salicicola, Davis, Jour. Ec. Ent., vol. 3, p. 490, 1910.
Williams, Aphididæ of Neb., Univ. Studies, vol. 10, No. 2, p. 55, 1910.
Aphis saliceti, Theobald, Rep. on Ec. Ent. for 1912, p. 84 (*theobaldi*).
Aphis salicicola, Davidson, Jour. Ec. Ent., vol. 5, p. 408, 1912.
Patch, Bul. 213, Me. Exp. Sta., p. 81, 1913.
Siphocoryne saliceti, Borner, Blattlausstudien, in Abhand, Naturwiss. Ver. Bremen, XXIII, pt. I, p. 164, 1914.
Aphis saliceti, Van der Goot, Beiträge zur Kenntnis der Holländischen Blattläuse, p. 225, 1915.

The *salicicola* of Thomas is undoubtedly a synonym of *saliceti* Kaltenbach, and the cases where the specific name is given as "*salicola*" are errors in spelling, Cowen being the first offender, and others following.

This species is of special interest because of the cytological work done upon it by Dr. N. M. Stevens and Dr. T. H. Morgan. We happen to know this is the species that was worked with as specimens were submitted to us by Dr. Morgan for identification. It differs from the others mentioned in this paper in its habit of remaining upon the willows throughout the year, and seems not to have an alternate summer host. It is also peculiar among the aphides, that deposit over-winter eggs, in that the sexual forms appear very early in the summer. We have taken the males and oviparous females at Fort Collins as early as June 20, and the eggs before the end of June. We know no other species approximating it in this respect. Our records for the capture of the sexual forms are as follows:

Woods Hole, Mass., June 29, 1909, L. C. Bragg.
Geneva, N. Y., June 30, 1909, C. P. Gillette.
Fort Collins, Colo., July 14, 1910, L. C. Bragg.
" " " June 17, 1912, L. C. Bragg.
" " " June 20, 1912, L. C. Bragg.
Lansing, Mich., July 12, 1912, C. P. Gillette.
Fort Collins, Colo., July 30, 1912, L. C. Bragg.
Manitou, Colo., June 14, 1917, L. C. Bragg.

We also have viviparous lice in the collection taken as follows:

Russia, 1893, N. Cholodkovsky.

Mass., 1909, T. H. Morgan.

Webster, Mass., June 19, 1909, L. C. Bragg.

Lyons, Colo., June 11, 1916, L. C. Bragg.

Fort Collins, Colo., June 11, 1917, L. C. Bragg.

Dr. Stevens, in her paper, referred to above, states that Kyber, in his paper on "Einige Erfahrungen und Bemerkungen über Blattläuse in Germar's Magazin der Entomologie, 1815, records finding sexual forms of what was, undoubtedly, this species, on willow in June, and she also reports taking the sexuales on June 29 at Harpswell, Maine.

Aphis theobaldi, n. sp.

Aphis saliceti Kalt., Theobald, Rep. on Ec. Ent. for 1912, p. 84.

The presence of the pre-caudal spine, or produced eighth abdominal tergite, and the cylindrical cornicles, are characters that readily separate this species from the others mentioned in this paper. It seems to be the species described and figured by Theobald in his Report on Economic Zoology for 1912, page 84, and Plate XIII, and Figure 24. The species is one having alternate food habits, and may be described from our material as follows:

Alate Viviparous Female.

From specimens mounted in Canada balsam. Head, thorax, antennæ, tarsi and distal ends of tibiæ, black or blackish; abdomen greenish or yellowish; cornicles cylindrical, .28 long, or about as long as the spur of the antennæ and yellowish in colour; cauda barely one-half as long as the cornicles; a short, blunt tubercle on the median line of the 8th abdominal tergite; antennæ nearly reaching the base of the cornicles; 1.13 long; joint III with about 40 strong tuberculate sensoria and longer than joint VI with the spur; spur as long as joints IV, V and VI combined; length of body, 1.50; wing venation normal.

Described from specimens taken at Geneva, N.Y., July 1, 1909.

Apterous Viviparous Female.

From specimens mounted in Canada balsam. Colour, a uniform yellowish brown, probably green or yellowish green in

life; legs, antennæ and cornicles yellow, with tips of antennæ and tarsi black; cornicles yellow and nearly cylindrical, slightly tapering and curved outward at the distal ends; .40 long, or fully as long as joint VI of the antenna with its spur; length of antenna, 1.20; joint III without sensoria; cauda rather broad and spatula-like; or pre-caudal tergite, a somewhat knobbed tubercle, fully half as long as the cauda, projecting directly above it and bearing two prominent hairs; antennæ and legs sparsely set with short, stout, blunt hairs that can hardly be said to be capitate; length of body, 1.60. See figures.

Described from specimens taken along with the alate viviparous females at Geneva, N.Y.

Both alate and apterous forms, in every respect like those described above, were taken at the same place and date on flower heads of *Heracleum* species, and we have also taken it from celery, Webster, Mass., 6, 19, 1909, so there can be little doubt but that this species also alternates between the willows and umbelliferous plants as in the cases of *capreæ* and *essigi*.

Siphocoryne capreæ (Fabricius).

Aphis capreæ, Ent. Syst. Nat., IV, 221, Syst. Ent. 217; Syst. Rhyng., p. 294, 1803.

Kaltenbach, Monographie der Pflanzenläuse, p. 109. 1843.

Rhopalosiphum capreæ, Koch, Die Pflanzenläuse Aphiden, p. 37, figs. 46–47, 1857 (not this species).

Rhopalosiphum cicutæ, Koch, Die Pflanzenläuse, p. 24, 1857.

Rhopalosiphum pastinacæ, Koch, Die Pflanzenläuse Aphiden, p. 41, figs. 52–54, 1857.

Siphocorynæ capreæ, Passerini, Gli Afidi, 1860.

Siphocorynæ pastinacæ, Buckton, British Aphides, vol. II, p. 24, 1879.

Rhopalosiphum salicis, Monell, Bull. 5, U. S. Geol. Surv., p. 26, 1879.

Thomas, 8th Report St. Ent. III, p. 194, 1879.

Siphocoryne salicis, Weed, Trans. Am. Ent. Soc., vol. XX, p. 297, 1893.

Siphocoryne angelicæ, Œstlund, Aphididæ of Minn., p. 70, 1887.
Rhopalosiphum capreæ, Gillette, Jour. Ec. Ent., vol. IV, p. 320, 1911.
Siphocoryne capreæ, Theobald, Rep. Ec. Zool. for 1912, p. 87.
Siphocoryne capreæ, Essig., Univ. of Calif. Tech. Bull., vol. I, No. 7, p. 342, 1917.

Siphocoryne essigi, n. sp.

Hyadaphis pastinacæ, Essig, Pomona Jour. of Ent. 1911, p. 534.

This species which was well described and figured by Essig, differs from *pastinacæ* by having the pre-caudal spine, and from *capreæ* by the long antennal spur and in other ways.

Siphocoryne pastinacæ (Linn.).

Aphis pastinacæ, Fauna Suecica, p. 259, 1761.
Aphis xylostei, Schrank, Fauna Boica, p. 107, 1801.
Aphis pastinacæ, Fabricius, Systema Rhyngotorum, p. 269, 1803.
Siphonophora pastinacæ, Buckton, vol. II, p. 24, 1879 (capreæ).
Hyadaphis pastinacæ, Schouteden, Mém. Soc. Ent. Belgique, p. 229, 1906.
Hyadaphis xylostei, Davis, Jour. Ec. Ent., p. 493, 1910.
Rhopalosiphum pastinacæ, Gillette, Jour. Ec. Ent., pp. 320–322, 1911.
Rhopalosiphum xylostei, Gillette, Jour. Ec. Ent., p. 320, 1911.
Hyadaphis pastinacæ, Essig, Pomona Jour. Ent., p. 534, 1911.
Rhopalosiphum xylostei, Murtfeldt, Jour. Ec. Ent., vol. 4, p. 226, 1911.
Syphocoryne pastinacæ, Theobald, Rep. on Ec. Zoology for 1912, p. 88.
Syphocoryne xylostei, Essig, Univ. of Cal. Tech. Bull., vol. I, No. 7, p. 324, 1917.

While Linnæus took his *pastinacæ* from *Pastinaca sativa*, and Schrank took his *xylostei* from the European honeysuckle, *Lonicera xylosteum*, we now know that the latter food plant is an overwinter host for *pastinacæ*, and, as the descriptions of these species do not differ in any important particular, we believe *xylostei* should be considered a synonym of *pastinacæ*.

Siphocoryne grabhami. Cockerell.

Canadian Entomologist, vol. XXXV, p. 342, 1903.

ODONATA OF THE RED DEER DISTRICT.

(Continued from page 103, Vol. XLIX).

BY F. C. WHITEHOUSE, RED DEER, ALTA.

In the introduction to my original publication I expressed the opinion that it would be slow work to lengthen the Odonata list in the vicinity of Red Deer to any extent. This has proved correct during the 1917 season, since I have succeeded in adding but one species. From 11th to 19th July, however, I devoted my time to collecting at Nordegg, Alta., the site of the Brazeau Collieries Ltd., situated 120 miles due west and, I should judge, just within the Hudsonian zone. The result of such collecting so far as the Odonata are concerned, was to add eight additional species to my list, and these of such special interest as to warrant a supplementary article.

Dr. Walker has kindly examined the material, and given the manuscript critical reading.

As in the prior list, the first numbers are my series, and the second refer to the pages of Muttkowski's catalogue.

Cœnagrionidæ.

CŒNAGRIONINÆ.

28–65. *Nehalennia irene* Hagen.

July 1st, north end Gaetz Lake, Red Deer, I saw a pair in coitu, but failed to take them. July 2nd, at the large slough north of the river, I captured a male and female. July 8th, 2 males at "run" of stagnant water west of Gaetz Lake.

All the insects were of adult colouration, and all were flying down among the slough grass. I was not previously familiar with this species, which probably accounts for my failure to note it last year. However, I am convinced that it is not common in this district—at least around waters where most of my collecting has been done. New to Alberta list.

29–66 *Cœnagrion interrogatum* Selys.

At Nordegg, 19th July, 30 couples of this rare insect were taken in probably less than half an hour and within a space of 50 feet. In the morning in question my friend Mr. K. Bowman, of Edmonton, was giving the Lepidoptera a short respite and me his his kindly assistance. At one time we had five couples in our

nets, i. e., more than all previous captures of *interrogatum* up to that time. All the insects were fully adult and flying in coitu.

Dr. Walker's descriptions and illustrations of this species are so thorough that little remains to be said. In the long series, however, one very obvious colour variation attracted attention, viz., that in several of the males, dorsal view, the black marking nearest the thorax (segment 3) is not pointed, but a plain black band.

For three seasons I have been on the lookout for *interrogatum*, and have made a practice wherever I noticed insects of the genus flying to capture a few for examination. At the slough in question I had examined both *resolutum* and *angulatum* before coming upon the prize. Now that I have located the spot where the insect may be described as *common*, it might be well to record it. It is the round slough north of the track, to be seen from the train just before pulling into Nordegg. The water is about eighteen inches deep and abounding with "suckers." The bottom is soft mud and free from weeds, though, at the margins, a slight fringe of reeds rises from the moss. A tamarack swamp adjoins the pond.

Of the specimens taken I placed 12 couples in alcohol and papered the balance in pairs. New to Alberta list, and most westerly record.

Libellulidæ.

CORDULIINÆ.

30–129 *Somatochlora albicincta* Burmeister.

At Nordegg between 12th and 19th July I took some 18 males and 3 females of this species. Of these two or three were captured at the top of what is locally known as Coliseum Mountain, 6,500 feet, one or two at the camp 1,200 to 1,500 feet below, and the balance down in the valley, say 4,000 feet. On 19th July, 13 males and 1 female were captured at the round slough described above (see C. interrogatum) flying with *S. hudsonica* and *C. shurtleffi*. On that day I searched the mossy edges of the pond for nymphs and took a number of exuviæ of *Æshna eremita*, which was in company with *A. juncea*, on the wing there and a series of what on circumstantial evidence should be *S. albicincta*.

With regard to the adults of *albicincta* that I captured, there was one feature in the general appearance that immediately

enabled me to distinguish them from *hudsonica*, quite apart from the appendages, viz., the impression that the white bands are interrupted dorsally.

31–129 *Somatochlora cingulata* Selys.

At the mountain camp at Nordegg on the evening of 14th July something flew by over the spring of water that looked like a huge *Somatochlora*, with *pink* bands. Next afternoon among the small spruce on the mountain top I was sweeping with my net at a female of *franklini* at rest on a spruce, when something large settled about a foot away. I diverted the sweep of the net to take the larger fly, for I had a good series of *franklini* and preferred to settle the identity of the insect. Then I put my arm in the net and drew out my captive, a large *Somatochlora* with pink bands. The July number of the Can. Ent., vol. XLIX, containing Mr. Kennedy's article on the cingulata group, had not arrived when I left Red Deer for Nordegg, and the insect was unknown to me. Of course, I realized that the pink bands were probably only teneral colouration, but that, and the identity of the insect could wait, what I must find was a male. But I saw no more *Somatochlora* of the required dimensions that day, nor the next. On the morning of July 17th July (to be my last on the mountain) I found three flying together on the top, close to where I had taken the female, but I seemed out of luck. One I took a risky flying shot at and struck with the rim of the net. It went off into the empyrean. Another I missed at rest on a spruce, at least it did not wait long enough, but thoroughly frightened, also went off into space. The third I stalked, on and off, for three or four hours. It would rest on the small spruce frequently, the long abdomen hanging quite perpendicularly, but never would it give me the chance I desired, and I dare not take a risky shot. At last the moment came. At rest on the extreme tip of a spruce bough and not too high. I crept nearer and nearer; then struck up with maximum speed. I had him at last—yes, a beautiful young male just at his prime.

During the next two days in the valley below, 4,000 feet, I saw no more of this species. The pair I took are in alcohol. New to Alberta list.

32–130 *Somatochlora franklini* Selys.

On the top of Coliseum 11th July I took 2 females of *franklini* flying with males of *S. minor*. It was not until the 14th that I captured any more, when I got 4 and also four males. On the 15th I took more females, the 16th more males and females, and the 17th again females only. I have a good pair in alcohol, but the insects were mostly but passing from the teneral stage, and among the papered specimens the percentage of casualties is regrettably high. I did not take, nor see, any of this species in the valley.

The wings of the females varied in the tinting considerably, due doubtless to some extent to the period since emerging. The darkest shade is best described a "smoky black." Like all the Somatochloras that I took on the mountain *franklini* rested frequently on spruce, etc., but the fact must not be overlooked that all the mountain specimens of this and the other species were young insects. New to Alberta list.

16–131 *Somatochlora hudsonica* Hagen.

At the round slough at Nordegg 19th July I took three males of *hudsonica* flying with *S. albicincta* and *C. shurtleffi*. Mr. Kennedy points out in his article (referred to above) that my 1916 captures at Red Deer are the only record for this insect, except the original three types taken 1861 at Ft. Resolution, Hudson Bay territory. The dates of my 1916 captures were given in my prior list, those of 1917 are as follows: Red Deer, 1st July, 3 males at the same "run" of still water north of Gaetz Lake; and the 3 males at Nordegg 19th July. In all I have, therefore, taken 13 specimens of *S. hudsonica*, of which only one was a female. The Red Deer and Nordegg insects were of about the same age, accountable, of course, to the change from Canadian to Hudsonian zone. Mr. Bowman, who has studied this point somewhat carefully in the Lepidoptera, informs me that he finds in the case of most species that occur both on the prairie and in the mountains there will be an average difference in appearance of two to three weeks.

33–131 *Somatochlora minor* Calvert.

July 11th on top of Coliseum, Nordegg, 2 females, flying among

the spruce. From that date to 18th July I took 12 more males and 12 females. The captures of 18th July, a male and female, were taken at the slough by the Forestry Station in the valley, 4,000 feet. The insects were all fresh and some damage occurred to the papered specimens. New to Alberta list.

34–132 *Somatochlora semicircularis* Selys.

At the camp, Coliseum Mountain, in the evening 16th July, I took a male at rest on a spruce. I immediately realized from the general appearance that the insect was distinct from the other somewhat similar species that I had been taking, i. e., *franklini*. Not only was it larger and had a relatively greater wing spread, but the abdomen, flattening to some extent in the process, attained its greatest girth at segments 6 and 7, and tapered again to segment 10, while in *franklini* the most robust segments are 7 and 8, and the reduction in 9 and 10 very slight. I have the specimen in alcohol. *Semicircularis* has previously been recorded from Banff and Laggan.

35–132 *Somatochlora septentrionalis* Hagen.

On the morning 18th July I had been collecting at the sloughs each side of the trail at the Forestry Station. At noon I was knee deep in slough when the Forestry Officer hailed me to come up to lunch. Dripping water, I climbed through the fence, and there in the enclosure I saw a *Somatochlora* flying in the shade of a Jack pine. If I had refrained from taking it from laziness, hunger or politeness, that fine male of *septentrionalis* would never have been captured, and I should not have taken eight different species of *Somatochlora* at Nordegg in nine days. The specimen is in alcohol. New to Alberta list.*

36–132 *Somatochlora walshii* Scudder.

A single female was taken on July 15th on the top of Coliseum. It was mistaken for *minor*, which it resembles very closely except in the form of the vulvar lamina.

Beside the 15 species of dragonflies dealt with, or indirectly

*A female evidently of this species, though differing from the published descriptions and figures of *septentrionalis* in the form of the vulvar lamina was also taken by Mr. Whitehouse on the top of Coliseum on July 12.—E. M. W.

mentioned, in the foregoing, it might be well to record others observed at Nordegg between 11th and 19th July, viz., *Lestes uncatus;* 1 female on top of mountain; *Æshna sitchensis*, 2 males on top of mountain, *Libellula quadrimaculata*, numbers at slough at Forestry Station; *Sympetrum rubicundulum decisum*, common on top of mountain and in the valley, *Leucorrhinia borealis* 2 males on top of mountain; *L. hudsonica*, common on mountain top and in the valley.

While the object of the collecting trip on the Coliseum Mountain was not solely dragonflies of the genus *Somatochlora*, the hopes of taking such insects was certainly one of the strong inducements. Just why I believed that I should find them on the top I do not know, and having found them another question presents itself. What are they doing there? It is not their true home as it is to the mountain-top butterflies *Colias nastes*, *Brenthis astarte*, etc., for these live there absolutely, and never descend to lower altitudes. In the case of dragonflies whether *Somatochlora* or any other genus this is clearly impossible, for there is no water. The insects must have passed the aquatic stages in the ponds, lakes, muskegs and creeks of the valley below, and with equal certainty they must return to the valley for ovipositing. I have already stated that all the insects taken on the mountain were young ones—many barely out of the teneral stage, and further that a male of *S. minor* would be found flying with females of *franklini*, and in the same way males of *albicincta* with females of *minor*. In other words they had not reached the stage when they must concern themselves with the next generation. My opinion, based on my observations, is as follows: that the teneral *Somatochlora* upon emerging aspires to higher altitudes and, judging from my captures at the camp, travels up the sheltering ravines in its journey to the top. Arriving there, it feeds; plays in the sun-lit glades of spruce or Jack pine; rests frequently and having reached the breeding stage once more returns to the valleys. This being the case it is clearly not *necessary* for the collector to work the mountain top at all. I think, however, that it may have one advantage, viz., that a representative variety of species, raised over a number of square miles of valley below, are conveniently assembled within a limited area.

LECTOTYPES OF HYMENOPTERA (EXCEPT APOIDEA) DESCRIBED BY ABBÈ PROVANCHER.

BY A. B. GAHAN AND S. A. ROHWER, WASHINGTON, D. C.

(Continued from Vol. L, page 33.)

Mesoleptus variabilis. (Faun. 1883, p. 759, not Nat. Can. 7, p. 115). Type.—Female, yellow label 682. 2nd Coll. Pub. Mus., Quebec.

Mesoleptus variabilis. (Nat. Can. 7, p. 115, not Fauna 1883, p. 795). Type.—Male, yellow label 1080, name label *Mesoleptus muliebris* Cress. 2nd Coll. Pub. Mus., Quebec. Apical joints of hind tarsi gone.

Mesostenus albicoxus. See *Phygadeuon.*

Mesostenus albifacies. Type.—Female, blue label 553; yellow label 1583. 2nd Coll. Pub. Mus., Quebec. Fair, somewhat oily.

Mesostenus apicalis. Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon finitimus* Cress.

Mesostenus armatus. Type.—Female, Harrington Coll. Pink label "P. 416."

Mesostenus brevipennis. Type. — Not in Pub. Mus., Quebec, unless under *Mesostenus promptus* Cress. This synonymy indicated by Provancher's annotated copy of Fauna.

Mesostenus collinus. Type.—Not in Pub. Mus., Quebec, unless under *Cryptus eburneifrons* Prov.

Mesostenus flavipes. Type.—Male, yellow label 459. 2nd Coll. Pub. Mus., Quebec. Fair.

Mesostenus jocosus. Type.—Female, yellow label 304. 1st Coll. Pub. Mus., Quebec. Lacks apices of antennæ.

Mesostenus latigaster. Type.—Female, Harrington Coll. Pink label "P. 407." Abdomen broken off and when glued on covered propodeum.

Mesostenus longicornis. Type. — Not in Pub. Mus., Quebec,, unless under *Mesoleptus moveni* Prov.

Mesostenus nitidus. Not Grav. See *Phygadeuon nitidulus.*

Mesostenus nobilis. Type.—Female, yellow label 1049.

2nd Coll. Pub. Mus., Quebec. Left antenna gone and apices of right wanting.

Mesostenus pallipes. Type.—Not in Pub. Mus., Quebec, unless under *Mesoleptus triangularis* Cress.

Mesostenus pluricinctus. Type.—Harrington Coll. Pink label "P. 462." Davis has labeled this *Diacritus muliebris* Cress.

Mesostenus ruficornis. Type.—Not in Pub. Mus., Quebec, unless under *Phygadeuon nitidulus* Prov.

Mesostenus ruficoxus. Type.—Not located. = *provancheri* D. T.

Mesostenus rufocinctus. Type.—Not located.

Mesostenus sagax. Type.—Female, yellow label 522. 2nd Coll. Pub. Mus., Quebec. Lacks left antenna and apex of right.

Mesostenus saint-cyri. Type.—Not in Pub. Mus., Quebec, unless under *Echthrus abdominalis* Cress.

Mesostenus tarsatus. Type.—Not in Pub. Mus., Quebec, unless under *Cryptus americanus* Cress.

Metacolus conicus. Type.—Female, yellow label 1365. 2nd Coll. Pub. Mus., Quebec. Fair.

Meteorus gracilis. Type.—Female, yellow label 1264. 2nd Coll. Pub. Mus., Quebec. Poorly mounted on tag. Antennæ and right hind leg missing.

Meteorus incompletus. Type.—Male, yellow label 1283. 2nd Coll. Pub. Mus., Quebec. Poorly pinned. Antennæ broken.

Meteorus politus. Type.—Female, yellow label 1266. 2nd Coll. Pub. Mus., Quebec. Badly pinned.

Meteorus robustus. Type.—Female, yellow label 1265. 2nd Coll. Pub. Mus., Quebec. Poorly pinned, one antenna beyond middle and hind legs at coxæ, gone.

Microctonus laticeps. Type.—Female, yellow label 1286; blue label 616. 2nd Coll. Pub. Mus., Quebec. Right antenna at 4th joint, front legs, right hind leg missing.

Meteorus vigilax. Type.—Probably male, yellow label 565. 2nd Coll. Pub. Mus., Quebec. Abdomen gone. Allotype, female without labels.

Microdus bicolor. Type.—Female, yellow label 905. 2nd Coll. Pub. Mus., Quebec.

Microdus dispar. Type.—Female, yellow label 1256(s). 2nd Coll. Pub. Mus., Quebec. Poorly tag-mounted.

Microdus nigricoxus. Type.—Female, blue label 656; yellow label 1572. 2nd Coll. Pub. Mus., Quebec.

Microdus quebecensis. Type.—Female, yellow label 581. 2nd Coll. Pub. Mus., Quebec.

Microgaster auripes. Type.—Female, blue label 673; yellow label 590. 2nd Coll. Pub. Mus., Quebec. One antenna broken at middle.

Microgaster brevicaudus. Type.—Female, yellow label 1167. 2nd Coll. Pub. Mus., Quebec. One antenna broken at tip.

Microgaster crenulatus. Type.—Male, yellow label 1577. 2nd Coll. Pub. Mus., Quebec. Left fore leg and left hind leg missing.

Microgaster lateralis. Type.—Yellow label 1306. 2nd Coll. Pub. Mus., Quebec. Antennæ, wings on right side and abdomen missing.

Microgaster melligaster. Type.—Female, yellow label 1301. 2nd Coll. Pub. Mus., Quebec. Antennæ broken at tip.

Microgaster 4-dentatus. Male, blue label 45, yellow label 1271. 2nd Coll. Pub. Mus., Quebec.

Microgaster rubricoxus. Type.—Male, yellow label 1576. 2nd Coll. Pub. Mus., Quebec. Antennæ and right hind leg broken.

Micromelus nigricornis. Type.—Yellow label 942. 2nd Coll. Pub. Mus., Quebec. Fair.

Mictropis nebulosa. Type.—Harrington Coll.

Monedula nigrifrons. Type.—Female, yellow label 1616. 2nd Coll. Pub. Mus., Quebec.

Monedula parata. Type.—Female, yellow label 1617. 2nd Coll. Pub. Mus., Quebec.

Monobia bicolor. Type.—Female, white label 61(s); yellow label 1629. 2nd Coll. Pub. Mus., Quebec.

Monodontomerus viridæneus. Type.—Not in Pub. Mus., Quebec, unless under *Oligostenus stigma* Fabr.

Monophadnus pallipes. Type.—Female, yellow label 1675. 2nd Coll. Pub. Mus., Quebec.

Mutilla canadensis. Type.—Not located.

Myrmica incompleta. Type.—Not located.

Nematopodius coxatus. Type.—Not in Pub. Mus., Quebec, unless under *Cryptus americanus* Cress.

Nematus decoratus. Yellow label 1541. 2nd Coll. Pub. Mus. Quebec.

Nematus fulvicrus. Type.—Yellow label 485. 2nd Coll. Pub. Mus., Quebec.

Nematus tetraopsis. Type.—Yellow label 1673. 2nd Coll. Mus. Parlement, Quebec.

Neuropenes ovalis. Type.—See Introduction. (Aphidiinæ.)

Neuroterus crassitelus. Type.—White label "Cap Rouge, Canada;" yellow label 934. 2nd Coll. Pub. Mus., Quebec. Bad condition. *Cynips* (*Neuroterus*) *crassitelus*—under *Cynips* in Provancher's catalogue.

Neuroterus terminalis. Type.—White label 114; white label 72(s); yellow label 1593. 2nd Coll. Pub. Mus., Quebec.

Nomia compacta. Type.—Not in Pub. Mus., Quebec.

Nototrachis canadensis. Type.—Female, yellow label 275. 2nd Coll. Pub. Mus., Quebec. Antennæ at scape and front legs missing.

Nysson nigripes. Type.—Male, yellow label 1429. 2nd Coll. Pub. Mus., Quebec.

Odontomerus canadensis. Type.—Female, yellow label 426. 2nd Coll. Pub. Mus., Quebec. Lacks right antenna. Male, allotype, without labels.

Odynerus antillarum. Type.—Not located.

Odynerus bimaculatus. Type.—Female, yellow label 1692. 2nd Coll. Pub. Mus., Quebec.

Odynerus robustus. Type.—Female, yellow label 1708. 2nd Coll. Pub. Mus., Quebec.

Odynerus tricolor. Type.—Male, white label 182, yellow label 1694. 2nd Coll. Pub. Mus., Quebec.

Odynerus truncatus. Type.—Male, yellow label 1693. 2nd Coll. Pub. Mus., Quebec.

Oenone sericea. Type.—Female. 2nd Coll. Pub. Mus., Quebec. Poorly tag mounted, right antenna broken at tip.

Oligostenus bimaculatus. Type.—Harrington Coll.

Ophion nigrovarius. Type.—Female, yellow label 273. 2nd Coll. Pub. Mus., Quebec. Antennæ, left hind leg beyond

femora, right hind tarsus in part gone; abdomen broken off but stuck on pin below label. Allotype—Male, yellow label 322. 1st Coll. Pub. Mus., Quebec.

Opius cinctus. Type.—See Introduction.

Opius macrocephalus. Type.—Not in Pub. Mus., Quebec, unless under under *Alysia rudibunda* Say.

Opius mellipes. Type.—n. n. for *O. pallipes* Prov.

Opius nanus. Type.—See Introduction.

Opius niger. Type.—See Introduction.

Opius pallipes. See Introduction.

Opius ruficeps. Type.—See Introduction.

Opius variabilis. Type.—See Introduction.

Orgilus detectus. Type.—Female, blue label 680, yellow label 1573. 2nd Coll. Pub. Mus., Quebec.

Ormyrus bruneipes. Type.—Female, yellow label 1358. 2nd Coll. Pub. Mus., Quebec. Fair.

Orthocentrus abdominalis. Type.—Female, yellow label 357. 2nd Coll. Pub. Mus. Quebec.

Orthocentrus albofasciatus. Type.—Male, yellow label 935. 2nd Coll. Pub. Mus., Quebec. Lacks apices of antennæ.

Orthocentrus canadensis. Type.—Male, yellow label 356. 2nd Coll. Pub. Mus., Quebec.

Orthocentrus carinatus. Type.—Male, yellow label 518. 2nd Coll. Pub. Mus., Quebec. Apices of antennæ gone.

Orthocentrus lucens. Type.—Not located.

Orthocentrus nigricoxus. Type.—Not located. Probably returned to collector.

Orthocentrus pilifrons. Type.—Yellow label 355. 2nd Coll. Pub. Mus., Quebec. Lacks antennæ, some legs and abdomen.

Oxybelus brodiei. Type.—Female, yellow label 1041. 2nd Coll. Pub. Mus., Quebec. Double mounted and with fly as prey. Apex of right fore wing gone.

Oxylabis spinosus. Type.—Blue label 759; yellow label 943. 2nd Coll. Pub. Mus., Quebec.

Pachyprotasus delta. Type.—Female, yellow label 496. 2nd Coll. Pub. Mus., Quebec. Right flagellum gone.

Pammegischia burquei. Type.—Female, yellow label 507. 2nd Coll. Pub. Mus., Quebec.

Paniscus albotarsatus. Type.—Male, yellow label 288. 2nd Coll. Pub. Mus., Quebec.

Paniscus albovariegatus. Type.—Male, yellow label 287. 2nd Coll. Pub. Mus., Quebec. Antennæ and abdomen at apex broken off.

Paniscus appendiculatus. Type.—Not in Pub. Mus., Quebec, unless under name, *Paniscus geminatus* Say.

Paniscus quebecensis. Type.—Not in Pub. Mus., Quebec, unless under name *Exetastes suaveolens* Walsh

Pantoclis inermis. Type.—Yellow label 1119. 2nd Coll. Pub. Mus., Quebec. Fair.

Paphagus rugosus. Type.—Yellow label 1383. 2nd Coll. Pub. Mus., Quebec. Badly mounted.

Paramesius longicornis. Type.—Yellow label 950. 2nd Coll. Pub. Mus., Quebec. Fair.

Pelopæus argentipilis. Type.—Not located.

Periclistus obliquus. Type.—White label 156; white label 74(s); yellow label 1594. 2nd Coll. Pub. Mus., Quebec.

Perilampus aciculatus. Type.—Blue label 767(s); yellow label 1359. 2nd Coll. Pub. Mus., Quebec. Antennæ and abdomen gone.

Perilampus lævis. Type.—Harrington Coll. Paratype—Yellow label 932. 2nd Coll. Pub. Mus., Quebec. Badly mounted.

Perilampus stygicus. Type.—Yellow label 1599. 2nd Coll. Pub. Mus., Quebec. Fair.

Perilitus incompletus. See *Meteorus*.

Perilitus mellinus. Type.—Female, yellow label 727. 2nd Coll. Pub. Mus., Quebec. Antennæ, median tarsi, right hind leg at coxæ, left hind tarsi broken.

Perilitus nigritus. Type.—Male, yellow label 1579. 2nd Coll. Pub. Mus., Quebec. Tag mounted. Right antenna entirely, left beyond middle, left posterior wing, median and hind leg on left and right hind tarsi missing.

Pezomachus niger. Type.—Female, white label 34(s); yellow label 1492. 2nd Coll. Pub. Mus., Quebec. Fair.

(To be continued)

BOOK NOTICES.

PLANT MATERIALS OF DECORATIVE GARDENING—The Woody Plants, by William Trelease, Professor of Botany in the University of Illinois, Urbana. Published by the Author 1917, $1.00 postpaid.

A good entomologist is necessarily more or less of a botanist. If he has not studied botany he is hampered in his work by his inability to name the food plants of his entomological captures. The modern entomology necessitates ecological study Doctor Trelease has prepared a little handbook under the title given above, which is inexpensive and of a size to readily fit the pocket, and which, nevertheless, includes within its flexible covers more than two hundred pages of condensed information which will apparently make it possible for any careful observer to learn the generic and usually the specific name of any hardy tree, shrub, or woody climber that he is likely to find cultivated in the Eastern United States (not in the extreme South) or in Northern Europe. Of course, on the more pretentious estates, or in nurseries or botanical establishments, introduced forms will be found which are not included in this book; but it indicates 247 genera and 782 species, with some 375 minor forms, or over 1,150 distinct kinds belonging to 83 natural families. The author, in his introduction, states that for a few hopelessly complicated genera, such as the haws, the cotoneasters, mockoranges and roses, only a few of the most easily recognized species have been admitted. Except for these, an effort has been made to include all but the newer species; and, by way of compensation for omissions, the common trees and shrubs of the orchard may be traced to their species, and also the commoner native shrubs and cover plants.

I have not tried to use this book in the field, but I am struck with the choice of easily observed characteristics of differentiation and with the full glossary. It is a book which every field entomologist should possess. L. O. HOWARD.

A PRELIMINARY LIST OF THE INSECTS OF THE PROVINCE OF QUEBEC, PART III—COLEOPTERA. By G. Chagnon, Montreal. Published as a supplement to Report of the Quebec Society for the Protection of Plants 1917.

It is gratifying to note the good progress made by the entomologists of the Province of Quebec in their arduous task of listing the insect fauna of their Province. With the appearance of the third part, three of the four largest orders have now been covered, and the work is, therefore, more than half-way towards completion.

The list of Coleoptera, numbering 1,810 species and varieties, is compiled from various published lists together with records of captures furnished by a number of collectors, of whom the author contributes a large majority. It is a very creditable list for a region of which but a small part has been explored from the entomological standpoint, and in which but few entomologists have made a specialty of the beetles. As the author remarks, the number of species which occur in the Province will be easily increased by over 500 by more assiduous collecting, particularly in the remoter districts.

Studies in Kansas Insects.—A Treatise of the More Common Species. Bulletin of the University of Kansas, Biological Series, vol. XVIII, No. 1, October, 1917.

This is a most useful report, which should find its way into every entomological library. It contains the following five articles: "The Grasshoppers of Kansas, Part I, The Melanopli of Kansas," by P. W. Claasen. This is divided into two parts, (1) Systematic, (2) Biologic and Economic. No fewer than 6 genera and 39 species are discussed. Part 2, "The Oedipodinæ of Kansas," by Raymond Beamer; a systematic account of this subfamily, which is richly represented in the State. It is abundantly illustrated, chiefly by photographs of actual specimens. "The Dragonflies of Kansas," by C. H. Kennedy, an annotated list with an analysis of the fauna from the standpoint of distribution, illustrated by 7 excellent plates. "Scale Insects Injurious to Shade and Fruit Trees, The Coccidæ of Kansas," by P. B. Lawson, a valuable descriptive account of the 75 species of this family known to occur in the State. All the species are well figured. "The Cankerworm—An Orchard and Shade Tree Pest," by Walter H. Wellhouse, a very full account of both species of cankerworm, describing their various stages, distribution, life-history, food, enemies, methods of control, etc. It is illustrated by 3 plates.

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POPULAR AND PRACTICAL ENTOMOLOGY.

A RED-LETTER DAY.

BY FRANCIS J. A. MORRIS, PETERBOROUGH, ONT.

Part I.

On July 2nd, 1917, I formed one of a party of friends who motored up to Chemong Lake. We were celebrating the holiday, but in a peculiar way; half an acre of ground had been rented by the more enterprising members of the party, and on it quite a respectable market garden was in process of culture; how respectable, you will perhaps best understand when I tell you that it yielded during the season several barrels of potato bugs. When Tom Sawyer wanted his fence whitewashed, he simply cracked up the job till his friends insisted on doing the work for him; much in the same way for more than a week—especially in the leisure hours of evening—my neighbour had been carefully preparing the ground for me to dig in with the hoe. But the strategic advantages of his position were more than neutralized by my thorough acquaintance with Tom Sawyer and the famous whitewashing episode. I was well aware that the picnic wasn't going to be all cakes and ale and that I should be expected to do my bit; but just as my neighbour took rod and reel, I took insect net and cyanide bottle, to provide for lucid intervals.

It was about half-past ten when our chauffeur drew up in a spacious cedar thicket almost at the water's edge. We found the occupants of the other car had stopped at the kitchen-garden instead of coming on the last half mile to headquarters. Feeling confident that there were not hoes enough to go round I invited the only other man in our party to come exploring the wood with me; he had spent 60 years diligently ignoring woods, so I knew he was pretty safe to refuse; and indeed I hardly waited to see what "starting-hole" of excuse he would wriggle down, before plunging into the shadowy cedar aisles in a direction calculated to bring me out near a big hill that I had noticed during the drive. This height commanded a view of the lake and was wooded in front all

down the steep slope to the shore; the trees were mixed, but with cedar predominating. On the top of the slope were 3 or 4 magnificent basswoods, a landmark for miles around.

Moving south-westward I soon shook myself clear of the cedar thicket, and crossing a somewhat spongy meadow began to ascend the slope. Half-way up I came upon a small clearing, partly filled in with raspberry bushes and surrounded on all sides by cedars. Hardly had I stepped into this, than a sharp, querulous bark, almost like a fox-terrier's, warned me that I had been discovered by a sentinel crow on its outlook post overhead. Almost immediately bedlam broke loose and the air was thick with these black, jabbering lunatics. For a moment I was puzzled to know why a general alarm had been rung in, but it was soon apparent, nearly every cedar round the edge of this hidden glade had 3 or 4 young crows roosting on its branches, and though at first they tried the dodge of "freezing" on their perch, they soon began hopping and fluttering clumsily into cover, while the old birds guarded their retreat.

Finding nothing of interest about the raspberry thicket or the elder shrubs in its midst, I resumed my climb and presently won out to the top. Here I paused and took my bearings; just beyond me, on the far side of a low bank of field-stone, topped by a rickety old rail fence, lay an open meadow, while over my head stretched the noble canopy of a giant basswood. If my tribe had a totem pole, it should be of either basswood or white pine, for most of my lucky finds have been about these two trees, and I seldom pass either without giving it a good look-over. If my faith had ever wavered, that tree effectually nailed my colors to the mast forever and a day: on the very first leafy branch and almost the first bit of foliage that caught my eye, there sat an unmistakable specimen of *Hoplosia nubila*. Now this beetle is far from common; during all the years of collecting in Port Hope, I had never seen it, and in three seasons at Peterborough I had taken but four, all on freshly fallen timber, three on basswood and one on beech.

There was a breathless moment of suspense while I captured the insect and registered a mental vow not to leave the spot till I had hunted high and low for further trace of its kind. For some minutes my eye ranged over the foliage for insects as searchingly

as an up-to-date spraying machine, but without result. I then drew close to the trunk of the tree, and on the jutting spike of a dead branch appeared another *Hoplosia nubila*. I had seldom found anything of much account on dry wood, but I recalled the book statement that this insect bred in dead limbs of basswood. Half the tree spread out on the meadow side of the low stone rampart, so I made to enter the field; on the upper end of a picket and again on the top rail of the fence I met—apparently, like me, getting over the wall—three more specimens of *Hoplosia nubila*.

Where had they come from? Had they dropped from the green foliage above, or emerged from a dry branch under the tree? I noticed now for the first time a large, dead limb lying along the bank of field stone—a windfall of several years ago—rotting, but fortunately not sodden from contact with the earth; the end away from the butt had one or two boughs still armed with broken branches, and one of these rose at an angle and was partly supported on the second rail of the fence right at the picket. Only an enthusiastic collector knows how my mouth watered and my heart danced when I looked closely at the picket and the branch here on the sunny side of the fence: resting on their surface, within easy reach, I counted 7 specimens of *Hoplosia nubila*. By the time I turned reluctantly away to join the hoeing-bee at lunch, I had captured 17.

As soon as lunch was over some of the men scattered to look for bait, hoping to catch a bass or two before revisiting the kitchen-garden. I, too, set out to look for bait, but as soon as I rounded the corner I dived into the friendly shelter of the cedars and made a bee-line for the basswood. The sun had almost given my recruiting ground the slip, but I succeeded in capturing 8 more specimens about the dead limb and the picket fence; and on visiting some trees further along the ridge I captured 2 more.

To test out the insect's habits and season I made it a point during the next few days to visit all the basswoods newly felled or dead that I could think of in the neighbourhood; on July 3rd I examined some newly felled basswood at Nassau and succeeded in capturing 3 specimens of *Hoplosia*, apparently attracted to the dying trees either to breed or to oviposit on the branches; and a few days later I took 5 on some windfalls and one on a lopped

branch in the same neighbourhood; also on July 4th, revisiting this dead limb of my first captures west of Chemong, I took 4 more specimens, including a mating pair and a single specimen in the very act of emerging, its head and antennæ alone being visible. Examination of the insect's burrow and of others in which I found larvæ, went to prove that it is fondest of dead wood and that it does not bore deep, the tunnels being all either in or just below the under bark. For nearly a fortnight I came across occasional specimens of the beetle, and had the unique experience of making one capture on a dead *maple;* altogether my catch for the season of this rare longicorn was well over 40 specimens. It never rains but it pours.

Part II.

On this holiday of July 2nd, it was still early afternoon when I returned to the picnic ground; learning there that the men, after landing a small sunfish, had been converted from angling-rods to hoes, I hurried off to encumber them with help. When I reached the fence and hailed the toilers, I found that the stony land in a fit of wanton mischief had smashed one of their hoes and—in short they scorned my proffered help and (in much the tone that the Athenians of old consigned a man "to the crows") they bade me be off to my beloved bugs.

"There's many a true word spoken in jest," though that was not the comment I muttered as I turned away in the direction of a fallen poplar by the roadside. It was a balsam or small balm-of-Gilead, and on it I found 2 specimens of *Hyperplatys aspersa*, my first that season. Working east, I then skirted the fence between the road and the market-garden. Almost at the corner of of the half-acre lot I noticed, doing duty for a top rail in the old snake-fence, a dead brush-head of hemlock; branches, twigs, and actually a few cones still in place; quite dry, even to the patches of resin upon it. I examined this closely in hopes of longicorns or buprestids, as the sun poured its burning rays over the surface, and presently on the south side I noticed a curious looking weevil that was strange to me; it was black and rough on the back, with a conspicuous, broad patch of dull, white across the elytra near the base; it reminded me a little, in pattern at least, of a somewhat uncommon beetle called *Eurymycter* which I have occasionally

captured; only the patch on this last is snow-white and situated at the outer end of the elytra.

Before dropping my prisoner into the *oubliette*, I took off my glasses and examined it closely; it was entirely new to me; on the centre of the thorax was a perfect little *fleur-de-lys* or trefoil of fawn-coloured pubescence, while on the scutellum was a tiny spot of white. On getting a front view of the head, I found it had the long, broad, flat "horse-face" of the *Anthribidæ*, and this feature was rendered all the more conspicuous from being white with dense pubescence. I had never ventured very far into even generic distinctions of the great Clan Curculio, and made no attempt when I got home to examine my find under a lens. But meantime I searched carefully over the bark of the hemlock for more, and at last, just when I was giving up the search, I spotted a second specimen (rather larger, but with decidedly shorter antennæ) right on the upper surface of the hemlock. Seeing two or three more hemlocks in the same condition of decay, I spent an hour of unremitting toil scouring their surface, above, below and on the sides, ferreting into every nook and cranny with searching looks; but all in vain.

When I came to pin my captures, I found that the tiny white scutellum had immediately behind it (i. e., further from its base) a spot of jet black pubescence that looked like a cavity, and also that the roughness on the elytra was strongest a little behind the base, where it rose into two bold tubercles (one on each elytron), for all the world like a pair of projecting shoulder blades; and these tubercles were partly within, partly without the white patch mentioned before. After dating the insects and putting them into one of the collecting cases in which I keep the season's catch from spring till fall, I soon forgot all about them in the more fast and furious fun of hunting Long-horns.

During July and August I was corresponding with a well-known New York coleopterist in the matter of *Microclytus gazellula* Hald. and its puzzling little doppelgänger *Microclytus gibbulus* LeC. This correspondence culminated in the arrival of a precious little box at our tent on Cache Lake. It contained a beautiful specimen of *M. gazellula;* in writing to thank for this most acceptable present, I promised the donor a verified pair

(♂ and ♀) of *M. gibbulus* as soon as I returned from camp. A few days after, I received a letter of acknowledgement, with a P. S. which declared that the writer had for years greatly desired to possess in his cabinet a specimen of a small beetle found, but rarely, on fungus-covered logs in our northern forests; it was called *Gonotropis gibbosus*. I had never heard this name before, nor did I know to what family the beetle belonged; so, naturally, my first thought was that I could never have come across the insect or I should have known the name, and further, that among the 10,000 or 11,000 beetles known in North America, it was most improbable I should ever stumble upon the particular one my correspondent desired.

When, moreover, I returned from the backwoods and drew out my Henshaw to find *Gonotropis* a weevil, I felt still more certain it was a case of looking for a needle in a haystack; nor was it much better to learn that it belonged to the small family of *Anthribids*, for of these I had only 2 or 3 representatives at most. However, I turned up the two works I possess on the weevils, LeConte and Horn's monograph and the recent book of Blatchley and Leng; here, avoiding the small print of detailed description, I looked to see the range and record of captures; from the older work I found that the insect was *sui generis* and (worse and worse!) that both generic and specific descriptions were founded on a single specimen from Colorado; the recent work did indeed record it over a very wide range on both sides of the border, but it was evidently extremely rare, for the senior author, Leng, was the very man who had written to me about it.

Having gone so far, however, I glanced over the detailed specific description: "convex, black; white face, proboscis and scutellum; broad, saddle-shaped patch of white near the base of the elytra; two humps on the 3rd interval;" and suddenly there rose out of the page before me the picture of a stony market-garden, two mocking men with hoes, a snake-fence, a dead hemlock rail, and that queer little pair of weevils squatting on the bark, like hobgoblins in a fairy tale. I jumped for the shelf on which my July captures lay cabined, and from the middle of a box most ludicrously labeled "Bachelors," drew out the tiny pair of

oddities (husband and wife, as sure as antennal measurements could make them) captured at Chemong on July 2nd.

I then subjected them to a careful scrutiny with the specific description before me. Point for point, they coincided throughout. The only thing debatable was the "deep fovea" behind the scutellum; if "behind" meant further from the base, there was no cavity there; I focused the insect under a two-inch objective in the microscope, and after some trouble succeeded in touching the centre of this so-called pit with the point of a fine needle mounted on a pen-holder; as soon as the needle point came into focus the insect was jarred into a blur, and when the vibration ceased there was the needle-tip still in focus and resting *on* the centre of the black spot; it was no fovea, but a tiny patch of jet-black pubescence on a level with the snow-white scutellum.

To the best of my belief, then, on July 2nd, 1917, besides capturing over a score of *Hoplosia nubila*, I had taken two specimens of this great rarity *Gonotropis gibbosus*, specimens, moreover, that by a unique stroke of luck formed a natural pair, male and female. If it never rains but it pours, assuredly on this date, in the quaint parlance of Geoffrey Chaucer, it fairly "snewèd" of good things.

A TIPULID FLY FROM BALTIC AMBER.

BY T. D. A. COCKERELL AND GRACE E. CLARK, BOULDER, COL.

In *Canad. Entom.*, 1915, p. 159, it was remarked that some of the Mycetophilidæ had remained without evolutionary progress in about a million years, exhibiting merely minor changes or the shuffling of characters, producing closely related species. The Baltic amber is probably twice as old as the Florissant shales, and yet, in spite of the great age of the specimens, dating back to Oligocene times, we find that many of the species differ little from those of to-day. Such, for instance, is the Tipulid fly now described. It presents an assemblage of characters which permit its recognition as a species; but we cannot say that it is more primitive or archaic in appearance than its descendants or representatives living in the same region at the present time.

Limnophila electrina, n. sp.

Male.—Body and legs dark reddish brown, thorax decidedly

reddened above; head black; tibiæ with minute spurs; antennæ as shown in Fig. 1.

Wings nearly 6 mm. long, without markings; subcosta branched at end, with lower branch a trifle longer than upper, its termination level with basal end of discal cell; radius straight except for a very slight upward bend at the end; radial sector sharply bent near its origin, with an appendicular nervure directed basad from the angle; R_2 and R_3 both show a gentle and practically even

Fig. 1.—*Limnophila electrina*, n.sp.: antenna.

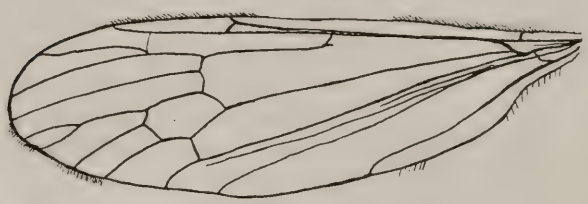

Fig. 2.—*Limnophila electrina*, n.sp.: wing.

curve; upper branch of media forked a considerable distance beyond end of discal cell, the stem a little longer than the fork; radial cross-vein joining radial sector at base of fork of its upper division (as in *L. nacrea* and *lentoides* figured by Alexander, and *L. rogersii* figured by Scudder); posterior cross-vein joining discal cell a little beyond middle; Cu_2 sharply deflected downward at its end.

The following measurements are in microns: end of Sc_2 to radial cross-vein, 784; upper apical corner of first basal cell to separation of R_2 from R_3, 496; radial sector from basal angle to end of first basal cell, 1089; discal cell on second basal, 352; discal cell a fifth posterior, 240; first posterior on third, 640; first posterior on second, 592.

In Baltic Amber; received from Mr. F. H. Ward.

This appears to be distinct from all the species described by Meunier from amber. The antennæ have bristles resembling those of *L. vulcana*, but the basal joint is far more robust. The wings appear to be quite distinctive.

THE INSECT COLLECTIONS OF THE MARITIME PROVINCES.

BY W. H. BRITTAIN, PROVINCIAL ENTOMOLOGIST FOR NOVA SCOTIA.

The following notes on the insect collections of the Maritime Provinces have been compiled from information sent me by the owners or curators of the collections referred to in the article. It has not been possible for the writer personally to examine all the collections, and accordingly he has to acknowledge his indebtedness to the following: Mr. Harry Piers, Curator, Provincial Museum, Halifax, N.S.; Mr. Jos. Perrin, McNab's Island, N.S.; Mr. Wm. Mackintosh, Provincial Entomologist, St. John, N.B.; Mr. L.S. McLaine, Fredericton, N.B., and Mr. A. G. Dustan, Annapolis Royal, N.S. In some cases the exact words of the foregoing have been used in describing the collections.

INSECT COLLECTION OF THE PROVINCIAL MUSEUM, HALIFAX, N.S.

The insect collection of the Provincial Museum of Nova Scotia consists of about 2,000 Nova Scotia specimens, most of which have been collected since 1900. It consists almost entirely of Lepidoptera, with a few Coleoptera, some Orthoptera and other miscellaneous insects. The principal components are:

1. The Russell Colection of Lepidoptera, consisting of about 259 specimens of butterflies and about 788 specimens of moths, total about 1,047 specimens, each with full data attached, and collected by John Russell in the vicinity of Digby, Nova Scotia. It was purchased from him in 1906 and 1909. This is part of the material upon which Messrs. Joseph Perrin and John Russell prepared their "Catalogue of Butterflies and Moths, mostly collected in the neighbourhood of Halifax and Digby, N.S.," which was published in the Proc. and Trans. N. S. Institute of Science, Vol. 12, pp. 258–290 (read 1909, published 1912).

2. The Eaton collection of Lepidoptera, with a few other insects, consisting of about 450 specimens, with data collected during a number of years by Miss Lucy C. Eaton, in the vicinity of Truro, Col. Co., N.S. Of these 379 were purchased from her in 1905 and the remainder under her donations. The Lepidoptera in this collection formed the basis of her paper on "The Butterflies of Truro, N.S.," which was published in the Proc. and Trans. N. S. Institute of Science, Vol. 9, pp. 17–18 (1895).

3. Miscellaneous specimens of Nova Scotia Coleoptera collected by A. H. C. Prichard, specimens of Orthoptera and other Nova Scotia insects from various sources.

Owing to the lack of proper insect cabinets for the preservation and display of all these specimens, they are at present stored in boxes and somewhat liable to attack by pests, but it is the intention of the institution to obtain proper cabinets for them as soon as possible.

Insect Collection of the Nova Scotia Agricultural College.

The great bulk of the material composing the collection of the Nova Scotia Agricultural College consists of specimens taken in the province by members of the entomological staff from the summer of 1913 up to the present time, together with a few insects captured in other provinces. There is also a small collection of Coleoptera taken in Kansas a good many years ago, as well as a certain amount of material received in exchange from various American entomologists.

All doubtful specimens have been submitted to specialists for determination. The Coleoptera have been determined by Professor Wickham and Dr. Van Dyke; the Lepidoptera, by Mr. Arthur Gibson; the Hemiptera by Messrs. E. P. Van Duzee, H. H. Knight and H. S. Parshley and the bees by Mr. Sladen. Dr. L. O. Howard and the members of his staff have from time to time reported upon a large number of insects of different groups.

The following account does not take into consideration a large number of insects that have been determined but not put away in the collection. There is also some accumulation of material that has not yet been put up ready for determination, and still more that we have not been able to get determined at all. The latter particularly applies to Diptera and to parasitic Hymenoptera.

In the Coleoptera we have about 1,000 specimens distributed over 38 families and 203 genera; in the Lepidoptera about 1,000 specimens, 25 families and 300 genera; Hemiptera about 800 specimens, 23 families and 115 genera; Hymenoptera 340 specimens, 10 families and 19 genera; Orthoptera, 164 specimens, 3 families and 13 genera. There are about 110 named species of Diptera, but the greater part of the material in this order is still

undetermined. The material in groups other than those mentioned is insignificant.

A complete card index is kept of all insects in the collection, with full details regarding each species. In this way it is intended to build up an authentic list of Nova Scotian insects as rapidly as this can be accomplished. The Lepidoptera are put up in Comstock cases with the bottoms lined with patent cord instead of wooden blocks. All other orders are placed in Schmitt boxes. After a representative number are placed in the regular collection, the remainder are placed in duplicate boxes to be used in exchange.

Other Insect Collections in Nova Scotia.

Mr. Jos. Perrin, McNab's Island, Halifax, N. S., has a private collection of Lepidoptera, mostly taken on McNab's Island. He also has twelve cases of American and foreign Lepidoptera. The collection is housed in an oak cabinet with thirty drawers and containing material collected for the Russell-Perrin List published February, 1912, and for the supplementary list published October, 1915. The number of specimens contained in the collection is 1,470, representing 286 genera and 122 species and varieties.

Mr. Perrin also has in his care at present eight Riker specimen mounts, containing 387 specimens of Lepidoptera taken at Stellarton, N. S., by Mr. C. B. Hills, of Wabana, Newfoundland. Many of these are of interest and are not yet identified.

Mr. Chesley Allen, Normal College, Truro, N.S., has collected in all orders but, with the exception of the Lepidoptera, most of the material has not yet been arranged, though work on this is now proceeding. Mr. Allen is especially interested in the Microlepidoptera and has a complete collection of Nova Scotian Crambinæ, including a number not recorded in the list. He is now preparing an article on this group.

Mr. Harry Piers, Curator, Provincial Museum, Halifax, N.S., has a private collection of insects, consisting mostly of Orthoptera, on which is based a paper dealing with this group, which he will shortly publish.

The collection of the Dominion Entomological Laboratory at Annapolis Royal consists of nearly 3,000 specimens, most of these belonging to the Lepidoptera and Hymenoptera, but the other main orders are represented to some extent. Much of the material is still undetermined.

Collection of Insects in the Natural History Museum at St. John, N. B.

The Natural History Society of New Brunswick was organized in 1862. The majority of the members at that time were geologists and ornithologists, and it was not until about 1884 that the first collection of the insects of St. John County was presented by Mr. H. E. Goold. Mr. Goold may be considered the pioneer entomologist of the Natural History Society of New Brunswick. A few years later Mrs. C. E. Heustis made a collection of insects in the vicinity of St. John and presented it to the Museum. For a number of years Mrs. Heustis was a contributor to the Canadian Entomologist. These collections were exposed to light and insects were almost entirely destroyed.

About 1895 Wm. McIntosh began making a general collection of the insects of New Brunswick. This collection has steadily grown, and at the present time numbers about nineteen thousand four hundred and sixty-seven specimens. Mr. A. G. Leavitt collected Hymenoptera for several years and recently presented his collection, numbering about two thousand specimens, to the Museum. Smaller collections have been presented from time to time.

At the time of writing the insect collections in the Museum number over 24,000 specimens, including several thousand specimens, which have not yet been incorporated in the general collection and a large number of unnamed "unique" specimens. As is the case in so many collections, the Lepidoptera outnumber the other orders. The general collection shows some five thousand one hundred and seventy specimens representing less than eight hundred species.

The New Brunswick material was determined mostly by Dr. Fletcher and Herman Strecker. The Noctuidæ were named by Dr. John B. Smith and Dr. Ottolengui: Geometers by Rev. G. W. Taylor, of British Columbia, and others by Dr. H. C. Dyar and Wm. Beutenmuller. The Hymenoptera, numbering some four thousand eight hundred and thirteen are not well worked up. Mr. Sladen determined a number of the bees, and Mr. H. H. Harrington many of the saw-flies, etc. S. A. Rohwer, of the United States National Museum, determined a number of the saw-flies, finding

twelve new species among them. Some hundreds of species remain undetermined. The Coleoptera were examined first by Mr. Harrington and later by Dr. Wickham. They include about six hundred named species and a considerable number undetermined, about four thousand one hundred and eighty-seven in all. The Diptera number about four hundred species, three thousand three hundred and sixty-five specimens, many unnamed not being enumerated. The other orders are not very well represented in the collection—Hemiptera about four hundred and forty-two specimens; Dragonflies, two hundred and thirty-one; Orthoptera, one hundred and twenty-nine. Stone-flies and their allies two hundred and seventy-six; other orders about four hundred and fifty-four.

It has always been the policy of the Natural History Society of New Brunswick to make its collections useful to the public, and with this end in view nearly two hundred large Denton tablets have been prepared showing the various insect orders, with life-histories of the important economic pests, useful insects, etc. These tablets have been around the province twice on "Better Farming Special" trains, and have been exhibited at a number of Agricultural Exhibitions. They are used in the Agricultural and Natural Study Short Courses for teachers in winter and summer, and are loaned to schools when available. Indeed, so much material has been given to schools and farmers and used for educational exhibits as to seriously deplete the general collection.

Other New Brunswick Collections.

A good many years ago the Provincial University at Fredericton purchased the Preston collection. These were collected by Dr. Preston, a homeopathic physician at St. John, and consisting of a cabinet of eight or ten trays. Four of these were Coleoptera, native and exotic forms herein represented. They are partially named. There are also two cases of Lepidoptera, native and exotic, partially named, and one case of Odonata. The collection is in poor condition at the present time, and evidently has not been touched for years. The University also has six trays of native insects, mostly Lepidoptera. A few of these have been named by Dr. L. W. Bailey and William McIntosh. They are not in very good condition.

The Dominion Entomological Laboratory at Fredericton has a collection of Diptera in which the New Brunswick forms are well represented, especially the following families: Tachinidæ, Tipulidæ, Tabanidæ, Syrphidæ, Dolichopodidæ, Muscidæ, Asilidæ and Anthomyiidæ. There is a small collection of parasitic Hymenoptera and one of Formicidæ fairly representative of the province. There are also a few Lepidoptera.

The foregoing are a few of the chief insect collections found in the Maritime Provinces. We have heard of others, but have been unable to secure accurate information concerning them. Doubtless still others are in existence, and it is hoped that this article may have the effect of bringing them to light. Up to the present time we have been unable to get word of a single systematic collection of insects in the Province of Prince Edward Island.

A NEW SPECIES OF SARCOPHAGA FROM BRITISH COLUMBIA.*

BY R. R. PARKER, BOZEMAN, MONT.

Sarcophaga vancouverensis, n. sp.

Holotype.—Male, collection of R. R. Parker.

Allotype.—Female, collection of R. R. Parker.

Paratype.—Male, United States National Museum.

Length 8 to 10 mm.

Male.—Head. Viewed from side parafrontals and genæ with dark reflections; from front transverse impression unusually dark. Breadth of front at narrowest part about one-third eye width; cheek height approximately one-third that of eye. Front prominent; frontal vitta at its narrowest part about three times width of each parafrontal. Second and third antennal segments very dark; third, one and one-half times length of second; arista short plumose to slightly beyond middle. Back of head with the black cilia behind eyes extending half-way to foramen, otherwise clothed with whitish hair. Gena with several irregularly placed hairs between transverse impression and lower eye orbit.

Chaetotaxy.—Lateral verticals absent; vibrissæ inserted slightly above oral margin; frontal rows of bristles extending but slightly

*Contribution from the Entomological Laboratory of the Montana State College, Bozeman, Mont.

April, 1918

below base of vitta, the lower few pairs somewhat divergent from its edges.

Thorax.—Metanotum clothed with sparse, slender, reclinate bristles. Spiracular hairs very dark, except those of spiracular cover which are light coloured at tips. Epaulets dark.

Wings.—Distinctly smoky under binocular; bend of fourth vein normally a right angle, anterior cross-vein scarcely more basal than end of first longitudinal (almost beneath it); third vein bristly; costal spine vestigial; section III of costa slightly greater than section V; calypters whitish, fringed with white hair.

Legs.—Dark. Posterior femur sub-cylindrical, a little arched; distal half of posterior ventral surface with a thin beard of long hair; anterior face with three rows of bristles, those of intermediate row few and not present distally, those of lower row scattered; tibia with anterior and posterior beards of long, coarse hairs, the former much the stronger. Middle femur clothed beneath with short hair; anterior and posterior ventral rows of bristles present, latter not complete proximally; distinct "comb" absent; tibia with a slight beard-like fringe of hair posteriorly; submesotibial bristle present.

Chaetotaxy.—Anterior dorsocentrals long, as long as the two anterior pairs of postsuturals; acrostichals absent; inner presuturals scarcely or not at all differentiated: three pairs of well developed postsutural dorsocentrals; praescutellar acrostichals present; scutellar apicals present: two or three sternopleurals, if three the middle one is very slender: lower sternopleurals slender, with hairs anterior to them.

Abdomen.—Clothed above with short, reclinate bristles, beneath with longer, mostly erect hairs. Ventral plates almost square (posterior angles not rounded), vestiture erect except that of third which is short and decumbent.

Chaetotaxy.—Second segment without marginal bristles; third with two marginals and four or five laterals (marginals and laterals may not to be separated by increased spacing, so that there may appear to be a complete marginal row of bristles).

Genital Segments.—First, shining black or deep brown, in profile slightly convex, for most part the hairy vestiture shorter than that of second, marginal bristles absent; second (g. s. 2),—

shining orange, anal area small, hairy vestiture long. Forceps (f.),—darkened, especially the distal portion, in profile the hairy vestiture extends well toward tip of prongs, later attenuate, curved forward and slightly spreading.

Genitalia.—See figure. Anterior claspers (a. c.), posterior claspers (p. c.), accessory plate (a. p.).

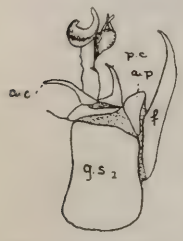

Fig. 3. — *Sarcophaga vancouverensis*, n. sp.: genitalia of male.

Female.—The single female examined differs from the male in the following important characters: breadth of front at narrowest part nearly equal to eye width; frontal vitta at its narrowest part about one and one-half times the width of each parafrontal, and just below ocellar triangle with several hairs at each side. Arista more plumose. Posterior femur spindle-shaped, its posterior ventral surface with a proximal row of bristles. Anterior and posterior rows of ventral bristles of middle femur complete. Costal spine short. Three sternopleural bristles. Vestiture of abdomen of short reclinate bristles throughout. Genital segments dull orange: first not divided into two lateral lips, but carinated on mid-dorsal line (appears like two lips), spiracles central and visible. Ventral plates overlapped and concealed by lateral edges of first genital segment.

Described from 7 male and 1 female specimens.

Range.—British Columbia, Vancouver, May 12 and 19, 1916, June 11, 1916; Savary Island, July 3, 1916. One specimen is labeled "Bd. Bay, May 22, 1915." Collector, R. S. Sherman.

Both holotype and allotype were collected on Savary Island on July 3, 1916.

We regret that the statement in our March issue concerning Professor W. A. Riley's change of position was inaccurate. A corrected statement is given below.

Professor Wm. A. Riley, who has been connected with the Entomological Department of Cornell University for the past eighteen years, has been appointed Professor of Entomology and Chief of the Division of Entomology and Economic Zoology at the University of Minnesota. He will continue his teaching work in Insect Morphology and in Medical Entomology.

AN APPARENTLY NEW SPECIES OF LEPTINILLUS. (COLEOPTERA, LEPTINIDÆ.)

BY G. F. FERRIS, STANFORD UNIVERSITY, CALIFORNIA.

The coleopterous family Leptinidæ includes but two genera and two species, but it is of especial interest because of the fact that these two species are exactly half of the number of species of Coleoptera that are known to be, or suspected of being, ectoparasites upon birds and mammals. Of the other two species one, *Platypsyllus castoris* Ritsema (the only representative of the family Platypsyllidæ) is a permanent, obligate parasite upon beavers in both its larval and adult condition. The other, a Silphid, *Lyrosoma opaca* Mann, is a resident of the nests of certain maritime birds but is suspected of utilizing the birds for purposes of transportation. Of the two Leptinids one, *Leptinus testaceus* Müll. is an oft-recorded resident of the nests of bumble bees and small mammals, but it has once been recorded as occurring on mice[1] and once from shrews[2]. The other, *Leptinillus validus* (Horn), is apparently a much less common form and of its habits nothing is known, except that it has once been taken from the skins of Alaskan beavers[1]. The discovery of a second species of *Leptinillus* with some definite information in regard to its habits is, therefore, of considerable interest.

Leptinillus aplodontiæ, n. sp.

Female.—Length 3 mm., depressed and broadly oval in shape, of a reddish brown colour, feebly shiny, the entire dorsum closely and uniformly beset with fine, setiferous punctations, the setæ short and slightly lighter in colour than the body. *Head* hemihexagonal in shape behind the frontal suture, the labrum convex anteriorly, the posterior angles of the head nearly right angles, the occiput much constricted and produced into the prothorax. Beneath the lateral margin at each posterior angle is a shallow, longitudinal groove which extends forward to the base of the antennæ and into which the first antennal segment may be received. *Antennæ* 11-segmented, slender, reaching but little beyond the posterior margin of the pronotum. *Mentum* with the posterior angles produced into a stout process about as long as

1. Riley, C. V. Insect Life, 1 : 306. (1889).
2. Kellogg, V. L. Science, N. S., XXXIX : 360–61. (1914).

the mentum itself. *Pronotum* anteriorly of the same width as the head, posteriorly about twice as wide, the greatest width about one and one-half times the length, the lateral margins arcuate.

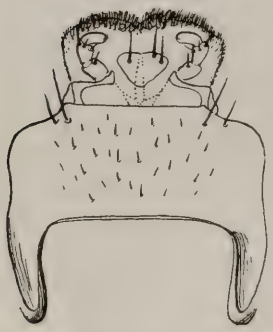

Fig. 4.—*Leptinillus aplodontiæ* n. sp.; labium.

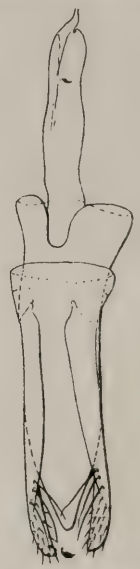

Fig. 5—*Leptinillus aplodontiæ* n. sp.; genitalia of male.

Prosternum extending over, but not separating, the anterior coxæ, without a brush of hairs at the tip. *Elytra* at the base very slightly narrower than the pronotum, then widening slightly, sharply

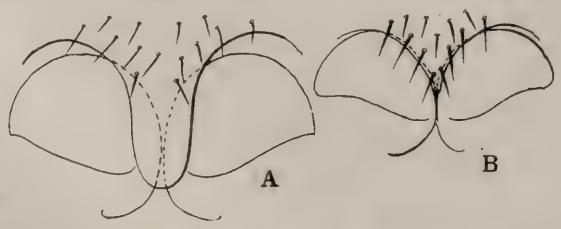

Fig. 6.—A: Prosternum of *Leptinillus aplodontiæ* n. sp.
B: Prosternum of *Leptinus testaceus* Mull. from a specimen from Forrester Id., Alaska, det. Van. Dyke.

rounded posteriorly, entirely concealing the abdomen. *Wings* lacking. Legs clothed with fine pubescence. *Abdomen* ventrally with fine, setiferous punctures.

Male.—Length 3.5 mm., elytra not concealing the tip of the abdomen. Otherwise resembling the female. Genitalia very closely resembling the genitalia of *Leptinus testaceus* Müll., as figured by Sharp and Muir[3].

Habitat.—From *Aplodontia* sp. (a genus of rodents peculiar to the Pacific Coast), Fallen Leaf Lake, Plumas Co., Calif., Aug., 1917. W. K. Fisher col.

Types.—Holotype, a female, and allotype, and thirteen paratypes, one dissected, mounted on slides and used as the basis of the accompanying figures, deposited in the collection of the Department of Entomology of Stanford University.

Remarks.—While this species is obviously very similar to *L. validus* (Horn) there are certain differences that are apparent upon a comparison with his original description[4] and later notes[5]. *L. validus* is described and figured as possessing a distinct brush of stiff hairs at the tip of the prosternum, a feature that is not present in the new species, and it is also indicated that the prolongations of the posterior angles of the mentum are very long and slender, while in my specimens they are short and stout as in *Leptinus testaceus* Müll. Nor do my specimens possess any trace of the eye spot described by Horn. Certain apparent differences in shape might easily disappear upon a direct comparison of specimens but there is a real difference in size, the new species measuring but 3 mm. in length for the female and 3.5 for the male as compared with 5 mm. for *validus*. Certainly as far as the literature is concerned there is sufficient ground for recognizing the specimens from *Aplodontia* as distinct.

It should be noted that although the prosternum extends back over the anterior coxæ it does not actually separate them, and they are in fact fully as contiguous as they are in *Leptinus testaceus* Müll.

Mr. Fisher informs me that the specimens were found upon two individuals of the host, and that they leave the host, after it

3. Sharp, D. and Muir, F. Trans. Ent. Soc. London, p. 506; pl. LI, f. 55–55a. (1912).
4. Horn, G. H. Trans. Amer. Ent. Soc., 4 : 145–6; figs. (1872).
5. Horn, G. H. Trans. Amer. Ent. Soc., 10 : 113–4; pl. 5, f. 1–6. (1882).

is killed, as soon as the body begins to cool. I have myself previously examined numerous specimens of the same genus of mammals in a search for ectoparasites but without result, but as all my specimens were examined some time after death it is possible that the beetles had already departed and that they may occur much more frequently than the lack of collecting records would indicate.

STUDIES OF CANADIAN SPIDERS IN SUMMER OF 1917.

BY J. H. EMERTON, BOSTON, MASS.

In the past summer I have continued the collection of Canadian spiders north and west of the region covered in 1915 and 1916, in the great bog country south and west of Hudson Bay, which has now been made accessible by the Grand Trunk Transcontinental line and the Hudson Bay railways. Starting in the latter part of June it seemed best to visit the most northern points first, and so in company with Mr. J. B. Wallis, of Winnipeg, I arrived at The Pas, June 30, and took the next train down the Hudson Bay Railway on July 4. The country all the way is nearly flat, descending from about 800 feet at The Pas to 350 feet at Kettle Rapids, 330 miles distant, and the present end of the road. It is covered with a thick layer of sphagnum moss in which grows a forest of small spruce with undergrowth of Labrador Tea and Mountain Cranberry. The drainage is naturally slow, and large and small lakes cover much of the country, connected by streams through which the summer travel of the country is carried on. After a few days at The Pas our next stop was at the railroad camp at mile 214, where we spent nearly a week, then at mile 256 where there is a large area of gravel rising to twenty feet above the general level and then to Kettle Rapids, where we collected for a week in the neighbouring bog and on the river banks. The spiders are for the most part, those which have been long known in the bogs of Maine and Labrador, the tops of the White Mountains or the Rocky Mountains. The most conspicuous species are the three cobweb spiders of the spruce trees, *Theridion zelotypum*, *Linyphia limitanea* and *Linyphia nearctia*. *T. zelotypum* covers the whole area from Kettle Rapids on the north to Minoki and Cochrane

on the south. *Linyphia limitanea* is also found through the whole area except the most southern stations. It is most abundant on trees growing near lakes and rivers. *Linyphia nearctica* appeared only at Kettle Rapids, the most northern station. It had previously been found at Nipigon, Montfort and Lake St. John and onthe coast of Maine and Labrador. For its eastern distribution see the Canadian Entomologist for January, 1917. With these species occurred usually *Lophocarenum decemoculatum*, *Grammonota pictilis* and occasionally *Dipena nigra* and *Tilla montana*, and in the southern part of the range *Theridion montanum*. Among the spiders without webs the most common was *Dendryphantes flavipedes* and in the southern part *Dendryphantes militaris* and *D. aestivalis*. The rarer *D. montanus* of the White Mountains occurred at Kettle Rapids, and with it *Sittacus rainieri* of the Rocky Mountains. Half-way along the railroad were found the rare *Habrocestum* (*Euophrys*) *cruciata* of the White Mountains, and also rare *Epeira aculeata* of Laggan and Jasper. The Lycosidæ were of species already known to extend across the continent. As usual where the ground is covered with sphagnum but few spiders were found in it, but in the southern part of the region where the land is higher and drainage better other mosses and leaf mold accumulate and the usual transcontinental spiders occur, *Pedanostethus fuscus*, *Tmeticus montanus*, *Hahnia agilis*, *Bathyphantes subalpina* and *Amaurobius borealis*. At Minaki a new *Lophocarenum* was found, closely resembling *L. sculptum* of the west coast and *L. excavatum* of the east coast. In the bog at Minaki was the black and white variety of *Epeira labyrinthea* with nests hung in the stiff grass near the ground as in bogs of Maine and New York.

Outside of the spruce forest area a little collecting was done at Dauphin and Winnipeg, and around the home of Mr. Criddle at Aweme. At the latter place two species of burrowing spiders, *Lycosa missouriensis* and *Lycosa wrightii* were found in great numbers in the sandy fields, as they are around Chicago and along the Great Lakes. At Dauphin and around the ponds at Cochrane occurred *Singa campestris* a species living in tall grass and before found at Kenora and Edmonton.

A PARTIAL KEY TO SPECIES OF THE GENUS AGROMYZA (DIPTERA.)

Second Paper.

BY J. R. MALLOCH, URBANA, ILL.

The species included in the present key are distinguished from their congeners by having the costa discontinued at or slightly beyond the apex of the third vein, and the halteres yellowish or whitish.

The larval habits of very few of the species are known and their known distribution indicates, not their actual range of occurrence but, rather, the fact that very little attention has been paid to the group by collectors. The same fact is in evidence throughout the genus.

This group contains species placed by other authors in *Napomyza* Haliday, and *Domomyza rondani*. Melander records the European species *anomala* Strobl. from Idaho and Washington. I have not seen this species.

1. Frons lemon-yellow; cross-veins very close together.....2
   Frons red or black.....4
2. Lateral margins of mesonotum broadly pale yellow; anterior 2 pairs of dorso-centrals much weaker than the posterior 2 pairs, the front pair much cephalad of suture. Food-plant unknown. Montana;
   Idaho.....(*brevicostalis* Malloch) *plagiata* Melander.
   Lateral margins of mesonotum not yellow, coloured as disc .3
3. Antennæ black; length of costa from humeral vein to apex of first two-fifths as long as next section; third vein ending little more than length of preceding section of costa before apex of wing. Larvæ mining in *Ranunculus abortivus*. Ind.; Ill.....*davisi* Walton.
   Antennæ black; length of costa from humeral vein to apex of first over three-fourths as long as next section; third vein ending over twice as far as length of preceding section of costa from apex of wing. Larvæ mining in *Verbena*, *Centaurea*, etc., Col.; Ariz.; Alaska;
   Europe.....*lateralis* Fallen

Antennæ yellow. Food-plant unknown.
Ill.....*aristata* Malloch.

4. Frons black.....5
Frons reddish.....10

5. Last section of fifth vein much longer than preceding section.....6
Last section of fifth vein shorter than or subequal to preceding section.....7

6. Last section of fifth vein about 2½ times as long as preceding section. Food-plant unknown. Ill.....*indecora*, n. sp.
Last section of fifth vein less than twice as long as preceding section. Larvæ mining cambium of *Prunus domestica*. N. Y.....*pruni* Grossenbacher.

7. Squamæ gray, fringes brown; last section of fifth vein nearly as long as preceding section. Food-plant unknown. N. H.; Europe.....*subnigripes* Malloch.
Squamæ whitish, fringes pale; last section of fifth vein slightly more than half as long as preceding section.....8

8. Pubescence on arista indistinct; occiput projecting on upper half; mesonotum with 4 pairs of dorso-centrals; cross-veins separated by about the length of outer cross-vein. Food-plant unknown. Ill.....*aprilina* Malloch.
Species without the above combination of characters; cross-veins separated by about twice the length of outer cross-vein.....9

9. Pubescence on arista indistinct; occiput not projecting; mesonotum with 3 pairs of dorso-centrals. Food-plant unknown. N. M.....*abbreviata* Malloch.
Pubescence on arista distinct; occiput projecting on upper half; mesonotum with 4 pairs of dorso-centrals. Food-plant unknown. Alaska.....*kincaidi* Malloch.

10. Mesonotum with 2 pairs of dorso-centrals; humeri yellow; general colour glossy black; small, robust species, 1.5–2 mm. in length. Food-plant unknown.
Md.; Ill.....*nitida* Malloch.
Mesonotum with 4 pairs of dorso-centrals.....11

11. Large, robust species, 4 mm. in length; general colour shining black. Larvæ mining cambium of *Prunus domestica*. N. Y.....*pruni* Grossenbacher.
Smaller, slender species, 2 mm. in length; general colour black, slightly shining. Food-plants unknown.
Alaska.....*parvicella* coquillett.

Agromyza indecora, sp. n.

Male and Female.—Black, shining. Frons opaque, orbits and ocellar triangle shining. Legs black. Wings clear, veins black. Halteres brown, knobs whitish yellow. Squamæ grayish, fringes blackish.

Orbital bristles strong, usually 6 in number; antennæ of moderate size, third joint rounded apically; arista swollen at base, microscopically pubescent; cheek narrow, its height about half as great as width of third antennal joint. Mesonotum with numerous short discal setulæ and 4 strong dorso-centrals; the pair of bristles between posterior dorso-centrals well developed. Abdomen stout. Legs stout, the pair of posterior bristles on mid-tibia very unequal in size. Costa ending just beyond apex of third vein; third and fourth veins very noticeably divergent apically; inner cross-vein usually at middle of discal cell or slightly beyond that point; outer cross-vein below apex of first vein; last section of fifth vein 2 to 2½ times as long as preceding section.

Length 2.5–3.5 mm.

Type locality, White Heath, Ill., June 24, 1916; June 29, 1917; (J. R. Malloch). Food-plant unknown.

This species is closely related to *pruni* Grossenbacher, but may be separated from it by the venation. This character is usually a rather unstable one, but my series of *pruni* contains no example with the last section of the fifth vein approximating to twice the length of the preceding section, while in the large series of *indecora* there is no specimen which has the last section of that vein less than twice as long as the preceding section. The inner cross-vein in *indecora* is usually but little beyond the middle of the discal cell, whereas in *pruni* it is generally one-third from apex of the cell. The third and fourth veins in *pruni* are but little divergent apically; in *indecora* they are strongly divergent.

LECTOTYPES OF THE SPECIES OF HYMENOPTERA (EXCEPT APOIDEA) DESCRIBED BY ABBÉ PROVANCHER.

BY A. B. GAHAN AND S. A. ROHWER, WASHINGTON, D. C.

(Continued from page 106.)

Pezomachus quebecensis. Type.—Not in Pub. Mus., Quebec, unless under *Pezomachus canadensis* Cress.

Pezomachus sulcatus. Type.—Not located. Probably in Harrington collection.

Phænocarpa rubriceps. Type.—Male, yellow label 1052. 2nd Coll. Pub. Mus., Quebec.

Phæogenes annulatipes. Type.—Harrington Coll.

Phæogenes aterrimus. Type.—Female, yellow label 435. 2nd Coll. Pub. Mus., Quebec. Left antenna at apex and left hind tarsus broken.

Phæogenes crassitelus. Type.—Female, yellow label 1196. 2nd Coll. Pub. Mus., Quebec. Ovipositor and sheath broken off at apex of abdomen.

Phæogenes falardeaui. Type.—Female, yellow label 666. 2nd Coll. Pub. Mus., Quebec. Allotype without labels.

Phæogenes gaspesianus. Type.—Female, yellow label 664. 2nd Coll. Pub. Mus., Quebec. Right antenna broken at 5th joint.

Phæogenes huarti. Type.—Female, yellow label 328. 2nd Coll. Pub. Mus., Quebec. Lacks abdomen.

Phæogenes indistinctus. Type.—Male, Harrington Coll. Pink label "P. 409." Lacks apex of left antenna. Labeled by Davis = "Phygadeuon."

Phæogenes mellinus. Type.—Female, yellow label 719. 2nd Coll. Pub. Mus., Quebec. Some verdigris.

Phæogenes nigricornis. Type.—Male, yellow label 988. 2nd Coll. Pub. Mus., Quebec.

Phæogenes orbus. Type.—Male, yellow label 514. 2nd Coll. Pub. Mus., Quebec. Antennæ broken at tip.

Phæogenes pinguis. Type. — Female, Harrington Coll. Head missing.

Phæogenes recticaudus. Type. — Female, yellow label 1197. 2nd Coll. Pub. Mus., Quebec. Abdomen broken off and glued on label.

Phæogenes recticornis. Type.—Female, yellow label 1200, blue label 15. 2nd Coll. Pub. Mus., Quebec. Right antenna at apex, right fore wing, hind wings, legs on left side, missing; abdomen broken off and glued on label.

Phæogenes sectus. Type.—Male, white label 439; yellow label 1552. 2nd Coll. Pub. Mus., Quebec. Lacks left antenna and left hind leg. On short pin.

Phæogenes tuberculifer. Type.—Male (?), yellow label 979. 2nd Coll. Pub. Mus., Quebec.

Phanerotoma fasciata. Type.—Yellow label 599. 2nd Coll. Pub. Mus., Quebec. Abdomen and antennæ beyond third joint missing.

Phasgonophora elegans. Type. — Harrington collection. Paratype.—Blue label 73(s); yellow label 1341. 2nd Coll. Pub. Mus., Quebec.

Philanthus harringtoni. Type.—Not located. Probably returned to collector.

Photopsis canadensis. Type.—Blue label 690; yellow label 1400. 2nd Coll. Pub. Mus , Quebec.

Phygadeuon abdominalis. Type.—Female, yellow label 218. 2nd Coll. Pub. Mus., Quebec. Some verdigris. Allotype.—Yellow label 271. 1st Coll. Pub. Mus., Quebec.

Phygadeuon acaudus. Type.—Female, yellow label 1017. 2nd Coll. Pub. Mus., Quebec. Complete but pin obliterates some of the characters.

Phygadeuon aciculatus. Type.—Male, yellow label 665. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon albicoxus. Type.—Male, yellow label 269. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon alternans. Type.—Yellow label 669. 2nd Coll. Pub. Mus., Quebec. Only thorax and coxæ present.

Phygadeuon annulatus. (Name preoccupied.) See *Phygadeuon fusiformis.*

Phygadeuon apicatus. Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon velox* Cress.

Phygadeuon ater. Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon helvipes* Cress.

Phygadeuon attenuatus. Type.—Female, yellow label 1048. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon autumnalis. Type.—Yellow label 640. 2nd Coll. Pub. Mus., Quebec. Thorax and part of legs on pin, rest missing.

Phygadeuon brevicaudus. Type.—Female, yellow label 1181. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon capitalis. Type.—Male, Harrington Coll. Pink label "P. 413."

Phygadeuon caudatus. Type.—Female, yellow label 265. 1st Coll. Pub. Mus., Quebec.

Phygadeuon cephalicus. Type.—Male, yellow label 663. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon constrictus. Type.—Yellow label 718. 2nd Coll. Pub. Mus., Quebec. Lacks abdomen and tarsi.

Phygadeuon cornutus. Type.—Female, yellow label 938. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon crassipes. Type.—Female, yellow label 276. 1st Coll. Pub. Mus., Quebec.

Phygadeuon cressoni. Type.—Not in Pub. Mus., Quebec. unless under *Ichneumon velox* Cress.

Phygadeuon curticrus. Type.—Female, yellow label 1558. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon dorsalis. Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon humilis* Prov.

Phygadeuon dubius. Type.—Not in Pub. Mus., Quebec, unless under *Phygadeuon pubescens* Prov.

Phygadeuon electus. Type.—Male, white label 1; yellow label 1117. 2nd Coll. Pub. Mus., Quebec. Lacks apices of antennæ. Provancher mistook sex.

Phygadeuon excavatus. Type.—Not located.

Phygadeuon fasciatus. Type.—In Pub. Mus., Quebec, with name label. Other data not obtained.

Phygadeuon fraterculus. Type.—Female, Harrington Coll. Pink label "P. 404." Lacks left hind leg below coxa and right hind tibia and tarsi.

Phygadeuon fusiformis. Type.—Female, Harrington Coll. Pink label "P. 391." Lacks left flagellum.

Phygadeuon goddessii. Type.—Not located. Probably returned to collector.

Phygadeuon gracilicornis. Type. — Female, Harrington Coll. Left antenna broken.

Phygadeuon guignardi. Type.—Female, yellow label 1178. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon hilaris. Type.—Not in Pub. Mus., Quebec, unless under *Phœogenes helvus*. Cress.

Phygadeuon impressus. (Nat. Can. Vol. 7, p. 212) Type.—Male, yellow label 213. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon impressus. (Nat. Can. Vol. 6, p. 281) Type. —Not in Coll. unless under name *Platylabus thoracicus* Cress.

Phygadeuon inflatus. Type.—Not located. Female, yellow label 221 bearing this name label in 2nd Coll. Pub. Mus., Quebec, cannot be type.

Phygadeuon inhabilis. Type.—Female, yellow label 205. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon insignis. Type.—Not in Pub. Mus., Quebec, unless under *Phœogenes herbus* Cress.

Phygadeuon jocosus. Type.—Female, old rose label 90, yellow label 1180. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon lavoiei. Type.—Female, yellow label 660. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon lechevallieri. Type.—Yellow label 692. 2nd Coll. Pub. Mus., Quebec. Lacks antennæ, legs, left wings and abdomen.

Phygadeuon longicornis. Type. — Female, Harrington Coll. Pink label "P. 388." Lacks apex of right antenna.

Phygadeuon lucens. Type.—Female, yellow label 270. 1st Coll. Pub. Mus., Quebec. Lacks antennæ.

Phygadeuon maculatus. Type.—Female, yellow label 206. 2nd Coll. Pub. Mus., Quebec. Lacks antennæ.

Phygadeuon marginatus. Type.—Male, Harrington Coll. One antenna and apical half of other missing.

Phygadeuon maturus. Type.—Female, yellow label 453. 2nd Coll. Pub. Mus., Quebec. Apices of antennæ and left fore wing gone.

Phygadeuon mignaulti. Type.—Female, yellow label 661. 2nd Coll. Pub. Mus., Quebec. Lacks right antenna.

Phygadeuon mucronatus. Type.—Female, yellow label 611. 1st Coll. Pub. Mus., Quebec.

Phygadeuon niger. Type.—Not in Pub. Mus., Quebec, unless under *Ichneumon extrematatis* Cress.

Phygadeuon nigriceps. Type.—Female, old rose label 40, yellow label 1179. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon nitidulus. Type.—Male, yellow label 262. 1st Coll. Pub. Mus., Quebec.

Phygadeuon occidentalis. Type.—Female, yellow label 263. 1st Coll. Pub. Mus., Quebec.

Phygadeuon orbitalis. Type.—Male, yellow label 513. 2nd Coll. Pub. Mus., Quebec.

(To be continued)

SOME SOUTH AMERICAN BEES.

BY T. D. A. COCKERELL, BOULDER, COLORADO.

Colletes chubutensis, sp. n.

♂.—Length about 10 mm., anterior wing 7.5 mm.; head, thorax and legs black, abdomen obscure steel-blue; head, seen from in front, forming roughly an equilateral triangle, the vertex being very broad; malar space extremely long, fully twice width of mandibles at base; mandibles red at apex; labrum rather weakly plicate basally; clypeus shining, very sparsely punctured, with a broad, band-like median depression; antennæ black, long, reaching metathorax; third joint 320 microns long, fourth 480, fifth 450; mesothorax and scutellum dullish, not polished; area of metathorax smooth and shining, with a sub-basal, transverse ridge, above which, in the middle, is a small pit; hair of head and thorax very long and abundant, white on face, cheeks and under side of thorax; sides of face with black hairs; hair of upper part of head and thorax with blackish intermixed, the whole appearing grey; tegulæ piceous; wings hyaline, faintly dusky, nervures and stigma dark fuscous; second s.m. extremely broad, receiving first r.n. in middle; legs with white hair, extremely long on anterior femora posteriorly; abdomen shining, hardly punctured; hind margins of segments narrowly brownish, without hair-bands; dorsal surface

of abdomen with very long, erect hair, white basally, but mainly black on apical half.

Chubut, Patagonia (from W. F. H. Rosenberg), U. S. Nat. Museum. In Friese's table of Chilean and Argentine *Colletes* this falls nearest to *C. biciliatus* Friese (*ciliatus* Friese, preocc.), from Chile, but it appears to be certainly distinct. Unfortunately Friese gives no detailed account of the male of *biciliatus*. In the North American fauna it falls nearest to *C. productus*, except for the colour of the abdomen.

Colletes rufosignatus, sp. n.

♂.—Length about 8 mm., anterior wing 5.5 mm.; black, the hind margins of abdominal segments obscurely brown, and apical tarsal joints dull ferruginous; malar space long, but less than twice as long as wide; mandibles red at apex; labrum smooth and shining, without distinct plicæ or pits; clypeus shining, sparsely punctured; antennæ black, only moderately long, but middle joints longer than broad; third joint 270 microns long, fourth 320, fifth 305; hair of head and thorax long, mainly dull white with a faint creamy tint, but some long, black hairs at sides of face, and more or less fuscous on vertex, while the hair on the scutellum is light orange-ferruginous; mesothorax shining, finely but not densely punctured; area of metathorax at base with plicæ bounding a series of pits, below this rugose, but with the lower end of the triangle smooth, the smooth area bounded above by a tuft of erect hair; tegulæ black; wings hyaline; nervures and stigma piceous; legs with white hair; on middle and hind tarsi the tufts of hair at ends of joints are reddish; abdomen shining, with minute, weak punctures, and long, thin, erect hair, white basally, largely black apically, but no hair-bands.

Chubut, Patagonia (from W. F. H. Rosenberg), U. S. National Museum. Allied to *C. patagonicus* Schrottky and *C. rhodaspis* Ckll., but apparently not the male of either. The colour of the scutellar hair suggests *patagonicus*, but that insect, at least in the female, has the other hair much darker.

Coelioxys bruneri, sp. n.

♂.—Length 8.2 mm.; black, with the first abdominal tergite entirely, the middle third of second and a smaller area on third, bright ferruginous; legs red, black basally (including part of

femora), the hind tibiæ also dark on basal half externally, and the hind tarsi black; mandibles red subapically; antennæ black; tegulæ clear ferruginous; wings rather strongly infuscated, especially apically; hair of eyes rather short (80 microns long); face densely covered with white hair; posterior orbits, especially below, with a fringe of short, white hair; mesothorax and scutellum densely, rugosely punctured, but the posterior disc of mesothorax and a small area in middle of scutellum, smooth and shining; mesothorax very thinly hairy, but anteriorly with two oval, oblique, bright, fulvous hair-patches; scutellum with a small median tubercle, directed upward; axillar spines slender, curved inward; mesopleura thinly hairy; stigma ferruginous; nervures fuscous; anterior coxæ spined; spurs ferruginous; abdomen dorsally shining, with large, scattered punctures; hind margins of segments fringed with white hair, weak on first, and interrupted on second; venter with broad, apical margin of first segment and base of second red; no ventral keel; fourth ventral segment produced and truncate in middle of margin; fifth with an apical pit; apical teeth of abdomen six, not counting very small ones or penultimate segment; lateral teeth long and slender; lower apical longer than upper; no median denticle.

Carcarana, Argentina (*Bruner*, 65), U. S. National Museum. Very near to *C. jujuyensis* Holmbg. (♀), but apparently not its male, on account of the rugose scutellum. Also close to *C. cordillerana* Holmbg., but that has the male abdomen 7-dentate. Also allied to *C. bruchi* Schrott., but quite distinct. The apical segment of abdomen is much less produced than in *C. rufibasis* Ckll., which closely resembles it in superficial appearance, though not in structure.

Pseudagapostemon pampeanus (Holmberg).

A male and female from Carcarana (*Bruner*, 77, 19) are provisionally referred here, but may represent a distinct species, and it is not certain that the sexes are correctly associated. The female is very close to *P. joergenseni* (Friese), but much broader. The genus contains a number of closely related forms, the relationships of which are not clearly understood.

Halictus (Chloralictus) bruneriellus, sp. n.

♀.—Length about 6.5 mm., anterior wing 5 mm.; head and

thorax bluish green, legs piceous, abdomen black, the hind margins of the segments faintly reddish; hair of head and thorax scanty, white; labrum with yellowish hair; mandibles obscurely reddish in middle; apical half of flagellum ferruginous beneath; clypeus short, black, with sparse coarse punctures; supraclypeal area shining green, with a few punctures; front densely punctured; mesothorax shining, the disc with sparse, large punctures; scutellum shining; area of metathorax rugose; posterior truncation distinct; tegulæ dark reddish brown; wings hyaline, very faintly dusky, stigma and nervures reddish brown; hind spur with three teeth; abdomen shining, with only minute, indistinct punctures; no hair-bands, but the usual thin, pale hair.

Carcarana, Argentina (*Bruner* 39), U. S. National Museum. Related to *H. spinolæ* Reed (*paramario* Friese) and *H. danicorum* Ckll., but considerably larger. In the North American fauna it resembles *H. subconnexus* Ellis, but differs by the narrower face, more copiously punctured mesothorax, more dusky stigma, and rugose base of metathorax.

Augochlora argentina Friese.

Carcarana (*Bruner* 80). Agrees with a specimen received from Friese.

Augochlora (Odontochlora) phoenomoë (Schrottky).

Carcarana (*Bruner* 86).

Augochlora (Pseudaugochloropsis) callisto Smith.

Carcarana and Bahia Blanca (*Bruner* 8, 75).

A NEW HOPLIA FROM FLORIDA.*

BY W. S. FISHER, WASHINGTON, D. C.

Among a collection of Coleoptera submitted by Mr. H. L. Dozier for determination, the following interesting new species of Hoplia was found.

Hoplia floridana, n. sp.

Male.—Elongate, black, shining. Upper surface sparsely clothed with short, semi-erect lanceolate, hair-like cinereous scales. Head strongly rugose, sparsely clothed with short, erect hairs. Clypeus one-half wider than long, feebly reflexed in front, when viewed laterally, not in the same plane as rest of head, but

*Contribution from the Branch of Forest Insects, Bureau of Entomology.

April, 1918

obliquely truncate; sides nearly parallel, truncate in front with the angles rounded; surface flat with large, round punctures, clothed with inconspicuous, erect hairs. Clypeal suture prominent and strongly elevated. Prothorax one-half wider than long; sides oblique to just in front of middle, then strongly angulate and slightly concave to the posterior angles, which are rounded; front angles acute; apex broadly emarginate; base nearly truncate; disc strongly convex with the surface finely rugose and sparsely clothed with rather short, lanceolate, hair-like cinereous scales, with longer, erect hairs along the lateral margins. Elytra one-half longer than wide, slightly narrowed posteriorly, surface rather strongly rugose with only traces of costæ and clothed similar to the prothorax. Pygidium strongly narrowed posteriorly, surface densely, finely rugose and clothed with hair-like scales similar to those on the elytra. Beneath, sparsely clothed with hair-like scales as above. Posterior femora short and very much swollen. Anterior tibiæ with two large, well developed teeth. Posterior tibiæ greatly enlarged posteriorly, surface with large, round, confluent punctures. Claws of front and middle tarsi chelate and unequal, the outer one being larger and bifid at the tip. Hind tarsi with a single claw which is not cleft.

Length 10 mm.; width 4.5 mm.

Female.—Similar to male except as follows: Colour reddish brown, shining. Surface rather densely clothed with yellow, nearly round scales, with a few semi-erect, short, lanceolate, hair-like scales of the same colour, the scales not being abundant enough to obscure the colour of the elytra.

Length 9 mm.; width 4mm.

Habitat.—Lake Wales, Florida.

Holotype (male), allotype and paratype (female) in the U. S. National Museum Collection; also two paratypes (male and female) in the collection of the Florida Agricultural Experiment Station at Gainesville, Florida.

Described from five specimens, two males and three females, received from Mr. H. L. Dozier and labeled "Agric. Exp. Station, Lake Wales, Florida, Ec. No. 219 & 220, J. R. W." In a letter from Mr. Dozier he states that "These specimens were collected April 7, 1917, with a report that they were feeding on citrus foliage."

This interesting species is easily distinguished from any other North American species by its peculiar clypeus, which is obliquely truncate in front of the clypeal suture, the latter being strongly elevated, and also by the greatly swollen posterior femora and enlarged tibiæ.

BOOK NOTICE.

THE BIOLOGY OF DRAGONFLIES (ODONATA OR PARANEUROPTERA).—By R. J. Tillyard, M.A., (Cantab.) B.Sc. (Sydney), F.L.S., F.E.S. Cambridge, The University Press, 1917. $4.50.

Since the publication in 1893 of Dr. Calvert's excellent "Catalogue of the Odonata of Philadelphia, with an Introduction to the Study of this Group of Insects," no general treatise on the biology of the dragonflies has appeared, and as Dr. Calvert's work is now long out of print and necessarily somewhat out of date, such a treatise has been much needed. Mr. Tillyard's book fills this need admirably. He has aimed "to present as full and complete an account of the biology of the Odonata as it is possible to offer in the present state of our knowledge of these insects," and he has spared no pains in carrying out this object. Every chapter bears the imprint of a thorough assimilation and careful sifting of the available data and a great deal of new matter has been added from the author's own extensive researches in many branches of the subject. With this wealth of material is combined a clearness and directness of diction, which, with the abundance of good illustrations and full glossary of technical terms should enable any biologist to follow the text without difficulty. A charm of novelty is added by the author's familiarity with the Australian fauna, from which he draws a large number of examples, in illustration of the various phenomena described.

Of the nineteen chapters ten are devoted chiefly to anatomical matters, including those on the external features, the wings, the larva or nymph, and the various organic systems. These are followed by chapters on a variety of subjects; embryology, coloration, classification, zoogeographical distribution, the geological record and bionomics; the last-named including a miscellaneous collection of facts, relating to habits, food, enemies, economic value, etc.

To these are added a chapter on British species and a final one on "Collecting, Rearing and Biological Methods."

The book teems with suggestive ideas, particularly regarding the phylogeny of various characteristic structures, such as the anal appendages, the pterostigma, the nodus and other venational features, the rectal gills of the Anisoptera, the caudal gills of the Zygoptera and the types of colour pattern. The wings of the Zygoptera are regarded as having been originally anisopterous, as were those of the fossil order Protodonata, their general reduction, especially in the anal area of the hind wings having been correlated with their use as mere "sculling organs" with no power of soaring or "planing."

In the scheme of classification adopted, the chief deviation from the systems usually followed is the separation of the family Lestidæ, with three subfamilies Epiophlebiinæ, Lestinæ and Synlestinæ. This change is based upon both imaginal (venational) and larval characters and appears to be well founded. Diagnostic characters are given for all the groups as far as the tribes.

The subject of Zoogeographical Distribution is considered from a somewhat novel viewpoint. The fauna of each geographical region is divided into three main groups, palæogenic, entogenic and ectogenic. The palæogenic fauna consists of isolated remnants of a past age, formerly more widely distributed than at present; the entogenic fauna of those groups which are most characteristic of the region in question, where they may form definite "zoocentres;" while the ectogenic fauna consists of such groups as have invaded the region from some neighbouring region in which they are entogenic. The same genus may be entogenic in more than one region. Separate tables are given of both ectogenic and entogenic genera, and their distribution in the various regions.

The fossil record, described in the next chapter, also contains many interesting suggestions, such as the probability that the larvæ of the Protodonata dwelt in damp earth rather than water, no larval forms having been preserved among the abundance of imaginal remains in the Commentry deposits, and the larval tracheal system of recent forms being a modification of an originally

terrestrial type. The remarkable forms constituting the suborder Anisozygoptera of Handlirsch are considered to be true Zygoptera of an early unreduced type, and are placed as subfamilies of Calopterygidæ and Lestidæ.

Some errors and minor defects are, of course, present in this, as in all books treating of so wide and varied a field, but as most of these have already been pointed out by other reviewers, we shall merely call attention to the following:

In the historical sketch in the introduction there is no mention of any American author. Some reference, at least, should have been made to the pioneer work of Hagen and the monumental labours of Dr. Calvert, than whom no one has done more to place our knowledge of the order on a sound and substantial basis. No mention of Bartenef's work on the Palæarctic fauna occurs in any part of the book.

On page 19 the cervical sclerites and gula are stated definitely to represent the skeleton of the last head-segment. This is by no means an established fact, as they have also been interpreted as belonging to the intersegmental membrane between the head and prothorax, being serially homologous with sclerites which are sometimes found in the two succeeding intersegmental areas.

The length of embryonic life is much more variable than is indicated (p. 242). Dr. Calvert has pointed out that in Pennsylvania the eggs of *Sympetrum vicinum*, deposited in the autumn, do not hatch until the following spring. This is also true in Ontario of *Boyeria vinosa* and almost certainly also in the case of the various species of *Æshna*.

In compiling the census of the Odonata of the world (p. 299) the Selysian monographs by Martin should not have been used for the nearctic region in preference to Muttkowski's catalogue, as they are incomplete and deficient in their treatment of the North American fauna.

We do not wish, however, to detract from the impression we have tried to give of the truly admirable qualities of Mr. Tillyard's book, for lack of space necessitates the omission of much that might be added in its praise. It is a book that is indispensable to every biological and entomological library.

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POPULAR AND PRACTICAL ENTOMOLOGY.

The Egg-Laying Habits of Some of the Acrididæ (Orthoptera).

BY NORMAN CRIDDLE, DOMINION ENTOMOLOGICAL LABORATORY, TREESBANK, MAN.

The egg-laying habits of the Orthoptera have not received as much attention as one might expect, considering the economic importance of many of the species involved. Even Riley, with all his remarkable researches, failed to observe that a locust's abdomen curls outwardly instead of under the insect when ovipositing and, strange as it may seem, his illustration has been accepted, until very recently, as correct. Much has yet to be learned regarding the exact number of eggs deposited by the various species, as well as the number of egg masses produced in a season, time of oviposition, etc. In the present paper an attempt has been made to show how some of our common Manitoba species proceed in the task of egg-laying and how the work is completed. So far as the notes presented below are concerned it will be seen that the species of Acrididæ, which oviposit in the soil, may be divided into two groups according to their method of covering the egg-sacks; the first of these comprising the Œdipodinæ, using the hind legs for that purpose, while the second—the Locustinæ—make use of the abdomen and ovipositor to attain the same end. These divisions, based upon habits, are, of course, subject to verification by the study of other species, but as they fall into natural groups there is reason to suspect that the rule will hold good, at least in those species which make an attempt to cover the eggs at all.*

With reference to the general attitude of locusts while oviposit-

*Hancock in his Tettigidæ of North America has related, with some detail, the egg-laying habits of Acrydium (=Tettix) also of *Tettigidea* in which strangely enough, the former is said to cover the eggs by use of the hind legs, while the latter uses the ovipositor.

Kellog and Gough—Rept. on Great Invasion of Locusts in Egypt in 1915 state that *Schistocerca peregrina* egg masses can be located while fresh by means of the white froth showing above the ground, hence it is probable that no covering is attempted in this species.

ing, this is usually similar to that of an individual while at rest. Occasionally, however, the legs are held rather far apart and rarely are elevated. The pictures of ovipositing females holding the posterior legs high above their body depicts a common attitude while the insect is forcing her abdomen into the soil. In the Œdipodinæ, at least, the position is so natural that it is necessary to view the insect closely to ascertain whether she is ovipositing or merely resting.

The fact that egg sacks are of various shapes is due to obstacles met with while the insect is drilling—egg masses are thus, at times, almost perpendicular, at others semi-horizontal. The natural shape is a gradual curl away from the ovipositing insect.

Œdipodinæ.

Arphia pseudonietana Thom. This beautiful species reaches maturity late in summer and oviposition takes place in September and October. An individual located on September 21, 1917, had her abdomen fully inserted into the ground when she was first found, in which position she remained stationary for 24 minutes. She then withdrew her ovipositor without depositing any eggs, and moving slightly commenced a fresh hole, taking six minutes in the operation. While thus employed she rested upon her four front legs and held the hind ones in the air, kicking spasmodically with first one and then the other. Having obtained the desired depth she became motionless and remained thus for 28 minutes. She then again withdrew her abdomen and commenced a fresh hole within an inch of the last, the results of which could not, unfortunately, be ascertained owing to the observer having to hasten away to catch a train. The situation in which this locust was attempting to oviposit consisted of sparse vegetation alongside of a dry ditch, the soil being rather hard and clay-like in texture. Many individuals of the same species were present in the vicinity.

A search on October 1st was rewarded by two examples being discovered ovipositing on the edge of an old trail, their operations were evidently well under way and became completed in 26 and 33 minutes, respectively. On withdrawing their abdomens the insects remained motionless for a few seconds and then slowly commenced kicking the soil into the cavity, pushing it in from

close around first and afterwards reaching out to gather it from as far as could be conveniently reached by stretching out for it with the hind legs. This work was done very thoroughly so that no sign other than a slight elevation remained to indicate where the eggs had been laid. The hind legs are generally used alternately for this work and are applied with additional vigor as the task proceeds. Then having completed their work the locusts either hop or fly quickly away. The egg-sacks were of the usual curled shape with a neck of glutinous matter that did not quite reach to the surface of the ground. They contained 24 and 25 eggs, respectively.

Camnula pellucida Scudd. Several examples were observed ovipositing near Boissevaine, Man., on September 20th. The land was dry and hard, and the vegetation thin with bare spots between. Many individuals were present. The egg-laying habits of this species are very similar to those of *Arphia*, described above. One example took 23 minutes to conclude her operations from the time when she was first observed with her abdomen inserted. She then carefully filled in the cavity using both hind legs for that purpose—the egg-sack contained 18 eggs.

Dissosteira carolina Linn. This large species can be found ovipositing without much difficulty during the month of September. For that purpose it seeks soil which is comparatively free from vegetation and situations that are fully exposed to the sun. A large, yellow female was found on September 19, 1915, having just completed working her abdomen into the soil, from which time she took 48 minutes to finish egg laying. The hole was then covered by use of the hind legs which were applied quite vigorously, the loose earth being chiefly drawn towards the insect from behind. This egg sack was almost two inches long, of which rather more than a third consisted of neck. It contained 42 eggs. A second example observed ovipositing on September 22 occupied an hour and 19 minutes, and took three extra minutes to cover the egg cavity. This latter operation was done entirely with the left leg. Three others were found on September 28, one of which took an hour and 21 minutes from the time she was first noted with her abdomen in the soil. In these instances both hind legs were used in covering the egg chamber.

Spharagemon collare Scudd. Egg-laying covers approximately the same dates as the *Dissosteira*. A female was seen seeking a suitable situation on September 25, and after three attempts to insert her abdomen chose a place close to some herbage in sandy soil. The customary kicking motion accompanied the drilling process. At the end of 34 minutes she withdrew her abdomen and hopped away without depositing any eggs. A second attempt, covering approximately the same time resulted in eight eggs being laid; whereupon the locust departed without any attempt to fill in the cavity. Another female on the same date took two hours and three minutes seeking for a suitable place to oviposit, and during that time thrust her abdomen into the soil on 24 occasions, remaining in some places for 15 minutes, at others merely making a short test. She frequently returned to the same situation, as a consequence of which seven tests were made within a few inches of each other. Eventually becoming satisfied she placed her eggs among the roots of a lambs'-quarters plant, commencing at dusk and finishing at 7.50 p.m. She then carefully covered the hole with her hind legs and staggered away, being weak from the cold—the temperature registering 50 degrees F. This egg-sack had practically no neck and contained but 11 eggs. Another specimen, on September 30, covered the hole with both forward and backward kicks. The egg-sack, though considerably larger than those mentioned above, contained but two eggs. A fourth egg mass provided 12 eggs. These were all buried on stubble land.

Spharagemon bolli Scudd. This species is often found associating with the last, but prefers less open situations. An ovipositing female, on September 29, had chosen a place in the middle of a trail close to some trees. She remained without moving for 42 minutes from the time when first noticed. The egg chamber was covered in the usual fashion and the egg-pod, with a neck reaching almost to the surface of the ground, contained 10 eggs. A second individual located two days later did not differ in its methods from that of the above.

Locustinæ.

Melanoplus atlanis Riley. This species, known popularly as the lesser migratory locust, ranks above all our native grasshoppers

in its economic importance. The destruction wrought by it in Canada has been second to none in recent times, and its numbers have only been surpassed by its close ally *spretus*, which caused such severe losses in Manitoba during 1873 to 1875 as well as on several dates previous to these dates. *Spretus*, however, does not seem to be a native of Canada, hence *atlanis* holds first rank in destructiveness as an inhabitant of our country. It may seem strange that a species so widely distributed and so well known as *atlanis* should have had so little attention devoted to its egg-laying habits. We are, of course, aware that it seeks dry, firm soil for ovipositing in and that it prefers stubble lands or old, deserted fields for that purpose, but while I can claim to have handled hundreds of egg-pods, I have only one record of seeing this species actually ovipositing.

The individual referred to was on the border of a stubble field and had partly completed her task before being observed. This, insect on withdrawing her ovipositor, carefully shoved the loose soil into the vacated cavity by aid of the abdomen, using the valves of the ovipositor as a rake. The earth in this case was first pushed in from close around and afterwards the insect reached out to the full extent of her abdomen and drew the soil towards her. Thus, in a short time no sign of the hole remained, after which the locust hopped quickly away. This egg-pod contained 16 eggs, which is about an average for the species.

Melanoplus angustipennis Dodge. The Manitoba examples of this species are chiefly of the red-legged form, called by Scudder *coccineipes*. It is a common insect which is most frequently met with on edges of low bushes.

On September 19th a female was observed searching for a suitable situation for egg-laying. She had already forced her abdomen into the soil and remained in that place for 10 minutes. She then moved away and tested 14 other spots within an hour and 10 minutes. During this search she travelled over considerable ground, usually walking, occasionally hopping and twice flying. The process of inserting the abdomen occupied approximately seven minutes. The method employed, which is practically the same in all species, consists of drawing the abdominal extremity well under the insect and then raising the hind legs and

throwing all possible weight backward on to the ovipositor, the valves of which are kept constantly in motion, in which the hind legs seem, as it were, to beat time. By this method the body is rapidly worked into the soil, after which the insect becomes motionless until she has laid her eggs. Unfortunately the individual mentioned above could not be followed in her final task. A second example observed, on September 23, first drilled into a clear piece of sandy soil, where she remained for 12 minutes, then becoming dissatisfied she hopped away and rested for a short time upon some herbage. The search was then continued and two more holes made, the last of which proved satisfactory. Here she remained, with her legs stretched far apart, for 87 minutes, after which the cavity was carefully covered in the manner described under *atlanis*. This last task occupying three minutes. The slowness of her work was doubtless due to the lateness of the hour, 5.42 p.m. and the coldness of the atmosphere, 51 degrees F. The egg-sack contained 14 eggs. A third locust, noted on September 29, continued her quest for an egg site for 27 minutes, inserted her abdomen into the soil four times and made a wide circuit among low bushes before she discovered a place to her liking. This proved to be alongside of a clump of grass upon which she rested her forelegs while drilling. Egg-laying on this occasion took 37 minutes; time, 3.57 p.m.; temperature, 73 degrees F. A fourth specimen on October 1st had already inserted her abdomen when first observed, and from then took 49 minutes in ovipositing. The egg mass consisted of 14 eggs.

Melanoplus packardii Scudd. Two examples were found on October 1st, ovipositing on the edge of a trail. The operations were evidently well under way and soon after being observed both locusts completed their work, covering the egg chambers with the abdomen in the customary manner. Egg-sacks contained 16 and 19 eggs, respectively. A third individual found searching for an egg site on the same date postponed her search after 32 minutes, owing to the weather becoming rainy and cold. When last seen she was hiding among the grass.

Melanoplus bivittatus Say. This is a locust of some economic importance, especially in the vicinity of low lands. It is very easily discovered while egg-laying, owing to its habits of oviposit-

ing along roadways or on old pocket gopher hills. An individual discovered on September 9th finished her work soon after being found, and her method of covering the egg cavity did not differ from that of *atlanis*. A second example found on a trail on September 26th, produced an egg-sack, the lower two-thirds of which was almost horizontal owing to the hardness of the soil beneath. A third, located September 28th, was on the edge of a stubble field alongside of a *Dissosteira carolina*, engaged in the same operation. When first discovered the former had her abdomen fully extended into the soil but ten minutes later she abandoned this place, due to the approach of a male *Dissosteira*. She returned, however, a few minutes later, and drilled a hole close to the former, one taking ten minutes to do so. She then became motionless for 49 minutes, at the end of which her work was completed. The egg-sacks of these three individuals contained 94, 98 and 102 eggs, respectively.

AN INTERESTING NEW HYMENOPTEROUS PARASITE.

BY A. B. GAHAN, BUREAU OF ENTOMOLOGY, U.S. DEPT. OF AGRICULTURE, WASHINGTON, D.C.

The description of this new species is desirable at this time in order to make the name available for use by Prof. S. I. Kornhauser, of Northwestern University, Evanston, Illinois, who contemplates the early publication of an account of its life-history.

Family BETHYLIDÆ.

Subfamily DRYININÆ.

Aphelopus theliæ, new species.

Female.—In Ashmead's key to species of this genus (Bull. 45, U. S. N. M.) this species runs to *melaleucus* but differs in the colour of the legs and in the absence of any white on the head. In J. J. Kieffer's key (Das Tierreich, 1914, Vol. 41, p. 215) it runs to *affinis*, but differs from the description of that species in having the face entirely black and the legs almost entirely black.

Length 2.2 mm. Black; mouth-parts except mandibles pale yellow, mandibles piceous; antennæ black, the scape beneath and the pedicel reddish; front tibiæ and tarsi more or less reddish; wings hyaline, the stigma black; veins pale. Whole head very finely, closely, almost granularly punctate, the punctures slightly

stronger on the clypeus; the anterior margin of clypeus slightly rounded; mandibles tridentate; face with a weak carinate median line extending from the base of clypeus half way to the anterior ocellus; eyes with only a very few scattered hairs, practically bare; antennal pedicel and first flagellar joint subequal, and together slightly longer than the scape; second flagellar joint a little shorter than the first; following joints to the last gradually shortening, apical joint nearly twice as long as the one before it, which is one and one-half times as long as broad; ocelli in an obtuse triangle; postocellar line much longer than the ocellocular; mesoscutum and scutellum sculptured like the head, parapsidal grooves absent; propleura longitudinally striate at least below; mesopleura a little more coarsely and irregularly sculptured than the mesoscutum; propodeum dorsally with coarse reticulations, the sides and posterior face more finely rugulose-punctate; stigma subovate, the stigmal vein slightly shorter than the width of stigma opposite; abdomen smooth and polished, ovate, a little longer than the thorax.

Male.—Agrees with female except as follows: palpi fuscous, antennæ wholly black, clypeus nearly truncate anteriorly, antennal joints a little more distinctly separated than in the female, the first flagellar joint scarcely longer than the second, flagellar joints beyond the first subequal except the apical one which is about one and one-half times as long as the penultimate joint.

Type locality.—Cold Spring Harbor, Long Island, New York.

Type.—Cat. No. 21604, U. S. N. M.

Host.—*Thelia bimaculata* Fabr.

One female and a male specimen sent to the Bureau of Entomology by Prof. S. I. Kornhauser, of Northwestern University, who is authority for the host record.

Subsequent to the drawing up of the above description, Prof. Kornhauser very kindly furnished the following note together with twenty additional specimens of the insect: "Specimens were reared from larvæ which bored through the sternites of the parasitized *Thelia*, dropped into jars of moist earth and there pupated. Fifty to seventy larvæ came from a single *Thelia*. This is a polyembryonic form. Oviposition takes place in early June, a single egg being deposited within the *Thelia* nymph. Emergence of full-grown larvæ takes place from the middle to the end of July."

DESCRIPTIONS OF EIGHT NEW SPECIES OF COLEOPTERA IN THE FAMILY MORDELLIDÆ.

BY EMIL LILJEBLAD, CHICAGO, ILL.

In the course of the writer's studies of the Mordellidæ, several collections have been submitted to me. Among these, there are several new species, which are described in this paper. Five of these, from Texas and New Mexico, are from the collection of Mr. J. W. Green; three species, two from the Atlantic Coast, and one from the Pacific Coast, are described from the collections of C. A. Frost, F. R. Mason, and F. W. Nunenmacher.

Diclidia propinqua, sp. nov.

Moderately elongate, clothed with very fine silvery pubescence, finely, transversely strigate; head behind the antennæ dark reddish brown; mouth-parts testaceous; maxillary palpi scalene; antennæ testaceous, first and second joints equal, each one-third shorter than the third, third and fourth equal, fifth one-third shorter than the fourth, sixth a little shorter than the fifth, seventh to tenth equal, converging towards the apex, eleventh elongate, pointed at tip, one-third longer than the seventh; thorax testaceous, sides rounded and rapidly converging from the middle to apex; mesosternum very little compressed and elevated; elytra with scutellar cloud, the suture to middle, a median band, and the apex, black; legs testaceous; abdomen black, or very dark brown; sixth ventral segment not visible. Length 3¾ mm.

Two female specimens from Jemez Mts., New Mexico, July 12–18; collected by Mr. John Woodgate.

The type is in the possession of the writer; the paratype is in the collection of Mr. J. W. Green, from whom the specimens where received.

This species is most closely allied to *Diclidia lætula* Lec., but can readily be distinguished from it by the character of the antennal joints, and by the colour of the elytra (which are pale at the apex in *D. lætula*).

Diclidia greeni, sp. nov.

Moderately elongate (more robust in the female); nearly entirely testaceous or flavo-testaceous (except in some specimens, which have an indication of a dark, transverse cloud near the apex

of the elytra), densely and very finely pubescent, transversely strigose; head a little darker; eyes black, emarginate and coarsely granulated; antennæ with third and fourth joints equal, fifth one-third shorter than the fourth, sixth shorter than the seventh, seventh to tenth nearly equal and a little wider than the sixth, eleventh twice as long as the tenth; thorax about one-half broader than long, the sides rounded and rapidly converging from a little before the base; mesosternum very much compressed and elevated; abdomen of the male with two long, flattened appendages which are widened distally and obliquely truncate at the apex.

Length 3–3¾ mm.

Thirteen specimens: one male from Davis Mts., Texas, July 9; four males and eight females from Chisos Mts., Texas, July 18–22; collected by Mr. J. W. Green, to whom this species is dedicated.

The type, from Chisos Mts., is placed in the writer's collection, paratypes in that of Mr. J. W. Green.

This species differs from *Diclidia lætula* notably in the shape of the mesosternum, in the character of the antennæ, and in the nearly uniform pale colour. J. B. Smith notes that his "specimens [of *D. lætula*] vary in the distinctness of the black markings, which are sometimes barely discernible;" these pale specimens are perhaps referable to *D. greeni*, rather than to *D. lætula*.

Anthobates LeConte.

Anthobates LeConte, in Agassiz, Lake Superior, 1850, p. 231.

This genus was based on the same type (*Anaspis trifasciata*) as *Pentaria*, and is of earlier date. The fact that the genus was based upon "false characters"* does not invalidate its use, according to opinion 14 of the International Commission on Zoological Nomenclature.

Anthobates dispar, sp. nov.

Subcuneate; clothed with very fine silvery pubescence, finely transversely strigose; head testaceous or flavo-testaceous; maxillary palpi scalene, acute at tip; antennæ with the six basal joints testaceous or flavo-testaceous, seventh to eleventh fuscous, first and second joints nearly equal in length, but the second the more

*For this reason LeConte and Horn did not use *Anthobates*. (Smith. Misc. Coll., 26, 1883, p. 408).

robust, third to fifth equal, sixth a little shorter than the fifth, seventh to tenth becoming gradually wider distally, eleventh elongate, one-third longer than the tenth; eyes elongate, black, very slightly or not at all emarginate, moderately granulated; prothorax testaceous or flavo-testaceous, widest at middle, then rapidly converging towards the apex, subrectangular at base; mesosternum much compressed and elevated; elytra black, with an oblong, testaceous or flavo-testaceous humeral spot, which reaches nearly to the middle, and an indistinct subapical pale spot; abdomen black; sixth ventral segment not visible. No sexual characters have been discovered. Length 2½ mm.

Four specimens from Jemez Mts., July 15–21, collected by Mr. John Woodgate.

The type is placed in the writer's collection, paratypes in that of Mr. J. W. Green, from whom the specimens were received.

A. dispar does not resemble any of the described species.

Anthobates bicolor, sp. nov.

Subcuneate, rather robust; densely and very finely pubescent; finely transversely strigose; head black; the mouth-parts and the six basal joints of the antennæ testaceous; antennæ with first and second joints equal, rather broad, third to fifth about equal, each shorter than the second, sixth a little shorter than the fifth, seventh to tenth gradually increasing in width, eleventh elongate; eyes black, with the emargination quite deep; maxillary palpi scalene, with the inner angle rounded; prothorax black, rapidly converging from base to apex; elytra testaceous, or flavo-testaceous, with dark scutellar cloud, and narrowly black suture; legs testaceous, the femora darker; undersides of the body black; sixth ventral segment not visible.

Length 2½–3 mm.

Nine specimens, five from Davis Mts., Texas, July 6–9; four from Chisos Mts., Texas, July 19; all collected by Mr. J. W. Green.

The type from Davis Mts., is placed in the writer's collection, paratypes in Mr. J. W. Green's.

A. bicolor seems to be nearest to the Mexican species, *P. brunneipennis* Champion, but differs from it in having the dark colour confined to the scutellar space.

Anthobates pallidus, sp. nov.

Moderately elongate; entirely testaceous or flavo-testaceous (except the antennæ, which have the five apical joints fuscous, and the eyes, which are black), densely and very finely covered with pale yellow or silvery pubescence, finely transversely strigose; antennæ with first to third joints about equal in length, the first and second more robust than the third, fourth and fifth about equal, each shorter than the third, sixth to tenth gradually increasing in width, eleventh elongate-narrow, one-third longer than the tenth; eyes rather coarsely granulated, with a shallow emargination; maxillary palpi scalene, concave on distal margin, pointed at tip; prothorax evenly rounded from base to apex, with a very faint impression on each side, basal angles rectangular; sixth ventral segment not visible. Length 2—3 mm.

Eight specimens from Jemez Mts., New Mexico, June 10–21; collected by Mr. John Woodgate.

The type is placed in the writer's collection, paratypes in that of Mr. J. W. Green, from whom the specimens were received.

This species is closely allied to *A. bicolor*, but can be readily separated by the pale colour of the head, thorax and under surface.

Mordellistena frosti, sp. nov.

Hind tibia with one strongly marked oblique ridge, about one-fourth from apex; first joint of hind tarsus with one very small ridge near the tip.

Linear; head black; mouth-parts and anterior legs ferruginous; antennæ reddish brown; thorax fuscous or with a trace of reddish brown lustre, basal angles and a narrow line at base with golden yellow pubescence; scutellum triangular, pale, and with minute punctures; elytra black, finely punctate, covered with fine brown iridescent pubescence; under surface black; anal style short and very slender, black. Length 4mm.

Two specimens from Aziscoos Lake, Maine, July 8; collected by Mr. C. A. Frost.

The type is retained by the writer; the paratype is in the collection of Mr. Frost, from whom the specimens were received, and to whom the species is dedicated.

This species is most closely allied to *Mordellistena confusa*

Blatch., but can be distinguished from it at once by the absence of the humeral spot on the elytra.

There is a slight variation in the colour of the antennæ in the two specimens at hand, the type having the apical angles of each joint yellow, whereas the antennæ are entirely unicolorous in the paratype. This difference may prove to be sexual on the examination of a large series.

M. frosti should follow *M. confusa* in a systematic arrangement.

Mordellistena masoni, sp. nov.

Hind tibia with four strongly marked oblique ridges (and a very small rudiment of a fifth); first joint of hind tarsus with four, second with two ridges.

Subcuneate; head and thorax dark reddish brown, covered with fine golden yellow pubescence; antennæ, legs and underside a little paler; elytra dark brown, with silky, golden pubescence forming the following pattern,—an oblique band from humeri nearly to suture, an entire marginal line, widest at the middle, where it forms an abbreviated band, a sutural streak, an apical blotch connected with the marginal line, and several spots located between the bands; anal style long and slender, black at tip. Length 4 mm.

Five specimens: two from Hemlock Falls, New Jersey, July 10; two from Eagle Rock, New Jersey, July 8; and one from Westville, New Jersey, July 21; all collected by Mr. Frank R. Mason.

The type, from Hemlock Falls, New Jersey, is placed in the writer's collection, paratypes in the collection of Mr. F. R. Mason, to whom this species is dedicated.

This species is nearest *M. cinereo-fasciata* Smith, differing from it in having a narrower form, and no pale humeral spot. It can be readily recognized by the presence of light pubescent spots on the dark area. In two or three specimens the middle band reaches nearly to the suture, and the marginal line is partly broken, suggesting that further variation may be found in a large series.

This should follow *M. cinereo-fasciata* in the systematic arrangement.

Mordellistena nunenmacheri, sp. nov.

Hind tibia with three short, slightly oblique ridges; first joint of hind tarsus with three, and second with two ridges.

Linear; entirely black, covered with short, brown, sericeous pubescence; head large and nearly as wide as the thorax; eyes coarsely granulated; thorax longer than wide, a little wider than the elytra, its base at middle with a diagnostic, V-shaped notch as wide as the scutellum; anal style moderately long, rather robust. Length 5 mm.

Seven specimens: five from Josephine Co., Oregon, June 8, and one from Plumas Co., California, June 14; all collected by Mr. F. W. Nunenmacher.

The type from Josephine Co., Oregon, is placed in the writer's collection; paratypes are in the collection of Mr. F. W. Nunenmacher, to whom this species is dedicated.

This species is nearest *Mordellistena unicolor* Lec., or *sericans* Fall., but can at once be distinguished by the triangular-shaped notch at the base of the thorax. Some of the specimens at hand have a very small rudimentary ridge on the tibia and first joint of the hind tarsus.

This should follow *Mordellistena ambusta* in systematic arrangement.

NEW NEARCTIC CRANE-FLIES (TIPULIDÆ, DIPTERA) PART V.

BY CHARLES P. ALEXANDER, UNIVERSITY OF KANSAS, LAWRENCE, KAS.

Subfamily Limnobiinæ.

Genus *Gonomyia* Meigen.

Gonomyia (Gonomyia) kansensis, new species.

Belongs to the *cognatella* group; antennæ orange basally; wings with cell *1st* M_2 open by the atrophy of the outer deflection of M_3; male hypopygium with the third pleural appendage powerful, bifid, the two arms subequal.

Male.—Length 4.5 mm.; wing 4.7 mm.

Rostrum and palpi dark brown. Antennæ with the basal segments orange, the flagellum dark brown with a dense pale pubescence. Head mostly pale, orange.

Thoracic notum brownish yellow with a sparse, grayish bloom. Pleura yellowish with a broad, dark brown, pleural stripe extending from the cervical sclerites to the base of the abdomen. Halteres

brownish. Legs with the coxæ and trochanters pale; femora and tibiæ light brown; tarsi towards the tips dark brown. Wings with a grayish yellow suffusion; stigma pale brown, indistinct; veins dark brown. Venation about as in *cognatella: Sc* ending just before the origin of the sector; cell R_2 very large; cross-vein *r-m* very long; cell *1st* M_2 open by the atrophy of the outer deflection of M_3; basal deflection of Cu_1 at the fork of *M*.

Abdomen dark brown, the tergal segments with the apical third yellow so the abdomen appears broadly annulated; hypopygium yellowish. Hypopygium of the *cognatella* type but differing notably in the details of structure: outer pleural lobe with long bristles on the outer half along the margin and a single stout bristle on the outer face near the base; pleural appendages as follows: outer appendage (*2*) (Fig. 1) very long and slender, with numerous hairs along the margin; pleural appendages *3* (Fig. 2) bifid as in *cognatella*, but shorter and more powerfully constructed, the dorsal arm blackened and strongly chitinized at its tip, the two arms about equal; appendage *d* (Fig. 3) is rather stout with about three tubercles before the apex each with a long bristle; at the tip with a long, curved bristle. Penis-guard (Fig. 4) as seen from the side shaped as in figure. Gonapophyses (Fig. 5) with an acute spine near the base.

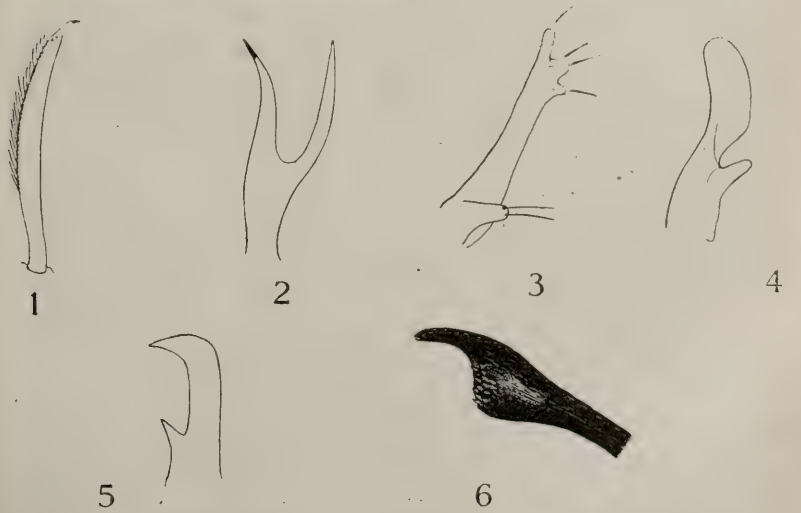


Fig. 7.—1-5, *Gonomyia kansensis*, n. sp., hypopygial details; 6, *Molophilus ursus*, n. sp., ventral hook of hypopygium.

Habitat.—Kansas.

Holotype.—♂, Jetmore, Hodgeman Co., Kansas, July 18, 1917 (Alexander).

Allotype.—♀, Larned, Pawnee Co., Kas., Aug. 1, 1917 (Alexander).

Paratypes.—4 ♀s, 1♂, with the allotype.

A review of the species of this genus in the United States will be found in the Proceedings of The Academy of Natural Sciences of Philadelphia, October, 1916, p. 508–528, Figs. 17–33, wings, and 59–91, hypopygial details. The lettering of the appendages is explained in that article under the consideration of *G. cognatella* and *G. florens*.

The majority of these specimens were taken along the Arkansas River near Larned; in life the specimens appear very pale and teneral as though not fully coloured. The immature stages are spent in the moist sand along the river, pupæ being secured from which the adults were bred.

Genus *Molophilus* Curtis.

Molophilus perflaveolus, new species.

Antennæ of the male not elongated; general coloration very light yellow; male hypopygium with four long, slender, chitinized appendages that are slightly curved toward their tips.

Male.—Length about 3.5 mm.; wing 5 mm.

Rostrum and palpi dark brown. Antennæ with the basal segments yellowish, flagellar segments brown, oval, slightly elongated, bearing long verticils that are much longer than the segments that bear them. Head reddish yellow, darkest on the disk of the vertex.

Mesonotum light orange-yellow, the interspaces with a whitish bloom, on the præscutum bearing numerous long, erect hairs. Pleura orange-yellow, sparsely white pruinose. Halteres light yellow. Legs with the coxæ and trochanters yellow; femora light brown, paler basally; tibiæ and tarsi light brown. Wings light yellowish; veins yellow with long, pale hairs. Venation somewhat as in *M. flutonensis;* basal deflection of Cu_1 longer than the deflection of M_3; Cu_1+M_3 not twice the length of the deflection.

Abdominal segments light brown; hypopygium elongated, light yellow, the pleural hooks black; abdomen clothed with

abundant long, pale hairs. Hypopygium with the pleural chitinized hooks four in number, very long and slender, not toothed, slightly curved toward the acute tips.

Habitat.—California.

Holotype.—♂, Fieldbrook, California, May 29, 1903, (H. S. Barber).

Molophilus spiculatus, new species.

Antennæ of the male not elongated; general coloration brown, the pseudosutural foveæ dark brown, conspicuous; male hypopygium with the dorsal pleural appendage short and broad, the dorsal face spiculate; ventral appendage long and slender with a few scattered teeth.

Male.—Length about 4 mm.; wing 5.3 mm.

Rostrum and palpi dark brown. Antennæ short, dark brown; second segment of the scape enlarged, cyathiform, dull yellowish; flagellar segments oval, slightly elongated. Eyes widely separated. Head gray, the anterior parts of the vertex and the occiput brighter coloured.

Pronotum yellow, medially with two dark brown spots. Mesonotal præscutum deep liver-brown, very sparsely gray pruinose; pseudosutural foveæ long and narrow, dark brown, conspicuous; space on the humeral angles before the foveæ yellowish continued back along the lateral margin of the sclerite to the wing-root; tuberculate pits conspicuous, separated from one another by a distance a little less than twice the diameter of one; remainder of the mesonotum bright brown. Pleura light brown. Halteres pale throughout. Legs with the coxæ and trochanters dull brownish yellow; femora dark brown apically, the basal half much paler; tibiæ dull yellow, broadly tipped with brown; tarsi brown, the basal portion of the metatarsi paler; last two tarsal segments almost black. Wings subhyaline or slightly grayish; veins brown, clothed with long, brown hairs. Venation $Cu_{1+}M_3$ about equal to the first section of M_{1+2} alone.

Abdomen dark brown, the hypopygium elongated, reddish; abdomen clothed with abundant pale hairs. Hypopygium with the ventral, finger-like lobe stout with scattered elongate hairs. The four chitinized appendages of the hypopygium shaped as follows: dorsal lateral arm broad, flattened, slightly curved, on the

dorsal face set with abundant spicules, the extreme apex a cylindrical spine; this appendage is bent slightly dorsad at its tip; ventral appendage much longer and more slender from enlarged, brown bases, with about six scattered teeth, at the apex bent strongly ventrad.

Habitat.—Colorado.

Holotype.—♂, Platte Canyon, Colorado, altitude 10,000 feet, August 26, 1915, (Oslar).

Closest to *M. paulus* Bergroth (Alaska) but the hypopygial details different, the dorsal appendage of *paulus* being shaped as follows: short, bent slightly inward, the apex an acute point, the surface of the appendage indistinctly denticulate; teeth on the ventral appendage differently arranged.

Molophilus ursus, new species.

Antennæ of the male not elongated; general coloration dark brown, the pronotal scutellum and the humeral angles yellowish; male hypopygium short with the ventral hooks powerful, at about mid-length enlarged and densely set with sharp, appressed spines.

Male.—Length 3.5 mm.; wing 5 mm.

Female.—Length 4.5 mm.; wing 5.8 mm.

Rostrum and palpi dark brown. Antennæ short, dark brown, the flagellar segments oval-cylindrical with long, dark verticils. Head brownish gray with long bristles.

Pronotum light yellowish. Mesonotum dark brown, sparsely gray pruinose; a conspicuous light yellowish triangle occupying the humeral portions of the præscutum before the foveæ. Pleura dark brown. Halteres dark brown, the bases pale, the knobs with pale, silky hairs. Legs with the coxæ and trochanters yellowish; femora brown, pale at the extreme base; tibiæ and tarsi dark brown. Wings dark-coloured; veins dark brown with long, dark brown hairs. Venation: Cu_1—M_3 moderate in length, a little shorter than the basal section of M_{1+2}; in one paratype very much shorter, subequal to the basal deflection of Cu_1.

Abdomen dark brown, the segments ringed caudally with paler; hypopygium short, stout, dark coloured; ventral hooks short and powerful (Fig. 7, *6*), narrow basally, gradually enlarged to about midlength, the outer angle thence produced outward as a strong, black, slightly curved tip, the middle portion of the ap-

pendage on the cephalic face densely beset with close, appressed spines.

Habitat.—New Mexico,

Holotype.—♂, Jemez Springs, New Mexico, altitude 6,400 feet; August 21, 1916. (John Woodgate).

Allotype.—♀, with the type.

Paratopotypes.—2 ♂♂.

Genus *Ulomorpha* Osten Sacken.

Ulomorpha sierricola, new species.

Size large, wing of the male 9 mm.; stigma of the wing pale brown, distinct.

Male.—Length 10 mm.; wing 9 mm.

Described from an alcoholic specimen.

Rostrum yellowish; palpi dark brown. Antennæ rather long and filiform, dark brown; flagellar segments elongate-cylindrical with numerous long bristles that are somewhat scattered, on the basal flagellar segments arranged in two distinct verticils, but on the terminal segments becoming much more scattered. Head dark brown above, paler beneath.

Thoracic dorsum dark brown, the humeral region of the præscutum paler. Pleura dull yellow. Halteres brown. Legs with the coxæ and trochanters dull yellow; femora dull yellow tipped with brown; tibiæ brownish yellow tipped with brown; tarsi dark brown. Wings with a strong, pale, brownish suffusion; stigma small, oval, brownish; veins brown; pubescence of the basal cells sparse and confined to the middle portions of the cells.

Abdominal tergites dark brown, including the hypopygium. Venation: vein R_{2+3} very short to lacking so that cell R_2 is very short-petiolate to sessile; cell M_1 lacking.

Abdominal tergites dark brown, including the hypopygium; basal sternites more yellowish.

Habitat.—Washington.

Holotype.—♂, Mt. Rainier, Washington.

In its pubescent wings this species suggests *Limnophila nigrilinea* Doane, but this last-named form has the venation entirely different and the resemblance is superficial only. From *Ulomorpha pilosella* (O. S.) it may be distinguished by its con-

spicuously larger size, distinct though pale stigma and slight differences in venation.

Genus *Eriocera* Macquart.

Eriocera brevipila, new species.

Cell *M1* of the wings present; antennæ short in the male; size small (wing of the male about 13 mm.); general coloration light gray; body clothed with a pale, moderately long pubescence.

Male.—Length 10.5 mm.; wing 12.8 mm.

Rostrum dark brown; palpi elongated, black. Antennæ short (for the male sex of this group of species), if bent backward extending about to the wing-root; first segment short and stout, dark above, pale beneath; remaining segments dark brown; first flagellar segment a little reddish at the base, on the ventral face with about four stout spines. Head dull gray, on the vertex before the tubercle, surrounding the antennal bases and adjoining the inner margins of the eyes reddish; an indistinct delicate, brown median vitta.

Thorax light gray, the præscutum with four dark brown stripes, the median pair separated from one another by a distance that is a little less than the width of one, these stripes not attaining the suture; lateral stripes shorter but broader; pile on the thoracic interspaces abundant, pale, shorter than in *albihirta;* scutum gray, each lobe with two brown marks; scutellum gray with conspicuous white pile; postnotum dark brown. Pleura with a sparse pruinosity; dorso-pleural membranes more yellowish. Halteres pale, the knobs dark brown. Legs with the coxæ pale grayish pruinose with a dense white pile; trochanters dull yellowish; femora dark brown, the bases yellowish, on the four anterior legs, including only the extreme base; tibiæ brown, broadly tipped with still darker brown; tarsi dark brown. Wings with a pale, brownish gray suffusion, the costal and subcostal cells darker; stigma small, oval, brown; veins dark brown. Venation: *Sc* ending opposite the fork of R_{2+3}; cross-vein *r* at about one-third the length of R_2, far removed from the tip of R_1; basal deflection of Cu_1 nearly at the middle of cell *1st* M_2; cell M_1 present.

Abdominal tergites dark brownish gray pruinose, the apical half of the organ somewhat darker than the basal half; sternites

brown, grayish pruinose; male hypopygium small, the appendages of the pleurite long and slender.

Habitat.—California.

Holotype.—♂, Bair's Ranch, Redwood Creek, Humboldt Co., Cal., June 12, 1903. (H. S. Barber).

This species is much smaller than the related *E. albihirta* Alex., differing ,moreover, in the shorter pile and the differently constructed male hypopygium.

Eriocera rubrinota, new species.

Coloration of the thoracic dorsum rusty red, remainder of the body, including the basal plates of the ovipositor, dark brown; cell M_1 absent.

Female.—Length 13 mm.; wing 11.5 mm.

Rostrum very short, brown; palpi dark brown with an indistinct grayish bloom and an indistinct median brownish line; vertical tubercle low with a deep notch.

Pronotum and mesonotum deep, rusty red without apparent markings. Pleura dark brown. Halteres dark brown, the extreme bases lighter coloured. Legs with the coxæ and trochanters dark brown; femora dark brown, yellow at their bases, these pale basal portions narrowest on the fore legs, broadest on the hind legs; tibiæ and tarsi dark brown. Wings suffused with brown; veins dark brown. Venation: *Sc* ending slightly beyond the middle of R_{2+3}; R_{2+3} a little shorter than R_2 alone; cross-vein *r* inserted on R_2, some distance beyond the fork of R_{2+3}; basal deflection of Cu_1 just beyond the fork of *M*.

Abdomen dark, shiny, blackish brown, including the basal portions of the ovipositor.

Holotype.—♀, in the collection of Kansas University, labeled "No. 40" without locality, but almost certainly from Western America, along with the other Williston material in the collection.

This species is abundantly different from all the forms described from the New World. It comes in the group with *E. fuliginosa* O. S., *E. tristis* Alex., etc., but is readily separated from them by the coloration of the mesonotum and the colour and structure of the ovipositor.

(To be continued.)

LECTOTYPES OF THE SPECIES OF HYMENOPTERA (EXCEPT APOIDEA) DESCRIBED BY ABBÉ PROVANCHER.

BY A. B. GAHAN AND S. A. ROHWER, WASHINGTON, D. C.

(Continued from page 137.)

Phygadeuon ovalis. Type.—Female, yellow label 211. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon pallicoxus. Type.—Yellow label 457. 2nd Coll. Pub. Mus., Quebec. Thorax, legs and wings on pin, rest missing.

Phygadeuon parallelus. Type.—Male, yellow label 939. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon planus. Type.—Female, yellow label 223. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon pubescens. Type.—Male, yellow label 273. 1st Coll. Pub. Mus., Quebec.

Phygadeuon rectus. Type.—Male, yellow label 204. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon robustus. Type.—Female, yellow label 458. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon rotundiceps. Type.—Female, yellow label 220. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon rubricus. Type.—Female, yellow label 701. 2nd Coll. Pub. Mus., Quebec. Extreme apex of left antenna gone.

Phygadeuon rubrocinctus. Type.—Female, yellow label 259. 1st Coll. Pub. Mus., Quebec. Somewhat oily.

Phygadeuon ruficornis. Type.—Male, yellow label 222. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon rufipes. Type.—Not in Pub. Mus., Quebec, unless under *Platylabus lineolatus*. Prov.

Phygadeuon segnis. Type.—Female, yellow, label 267. 1st Coll. Pub. Mus., Quebec.

Phygadeuon signatus. Type.—Female, yellow label 258. 1st Coll. Pub. Mus., Quebec.

Phygadeuon similaris. Type.—Male, Harrington Coll. Pink label "P. 399." Antennæ gone beyond 3rd joint; mounted so propodeum is hard to see.

Phygadeuon subspinosus. Type.—Male, yellow label 668. 2nd Coll. Pub. Mus., Quebec.

Phygadeuon tegularis. Type.—Not in Pub. Mus., Quebec, unless under *Phygadeuon alacris* Cress.

Phygadeuon terminalis. Type. — Not in Pub. Mus., Quebec, unless under *Ichneumon caudatus*.

Phygadeuon terminatus. Type.—Female, yellow label 437. 2nd Coll. Pub. Mus., Quebec. Abdomen off but glued on label.

Phygadeuon 3-annulatus. Type.—Female, yellow label 981. 2nd Coll. Pub. Mus., Quebec. Abdomen and apices of antennæ gone.

Phygadeuon truncatus. Type.—Not located.

Phylax niger. Type.—Ent. Branch, Dept. Agr., Ottawa.

Phyllœcus bicinctus. Type.—Female, yellow label 180. 1st Coll. Pub. Mus., Quebec.

Phytodietus elegans. Type.—Female, yellow label 1653. 2nd Coll. Pub. Mus., Quebec.

Phytodietus ornatus. Type.—Female, yellow label 1654. 2nd Coll. Pub. Mus., Quebec.

Phytodietus superbus. Type.—Female, yellow label 1652. 2nd Coll. Pub. Mus., Quebec. Lacks antenna beyond annulus.

Phytodietus zonatus. Type.—Yellow label 514. 1st Coll. Pub. Mus., Quebec. Lacks abdomen and right antenna.

Pimpla æqualis. Type.—Female, yellow label 715. 2nd Coll. Pub. Mus., Quebec. Lacks apex of left antenna.

Pimpla hirticauda. Type.—Female, yellow label 1252. 2nd Coll. Pub. Mus , Quebec.

Pimpla 4-cingulatus. Type.—Female, yellow label 714. 2nd Coll. Pub. Mus., Quebec.

Platygaster aneurus. Type.—Yellow label 1329. 2nd Coll. Pub. Mus., Quebec. Fair.

Platylabus aciculatus. Type.—Yellow label 1187. 2nd Coll. Pub. Mus., Quebec. Lacks one hind leg beyond femora.

Platylabus cincticornis. Type.—Female, yellow label 1188. 2nd Coll. Pub. Mus., Quebec.

Platylabus crassicornis. Type.—Female, yellow label 1186. 2nd Coll. Pub. Mus., Quebec.

Platylabus lineolatus. Type.—Female, yellow label 686. 2nd Coll. Pub. Mus., Quebec.

Platylabus magnificus. Type.—Female, old rose label 66, yellow label 1184. 2nd Coll. Pub. Mus., Quebec.

Platylabus mitralis. Type.—Female, yellow label 1185. 2nd Coll. Pub. Mus., Quebec.

Platylabus ornatus. Type.—Female, yellow label 244. 1st Coll. Pub. Mus., Quebec. Head missing.

Platylabus 4-carinatus. Type.—Male, yellow label 443. 2nd Coll. Pub. Mus., Quebec. Antennæ gone.

Platylabus rubricapensis. Type.—Female, yellow label 717. 2nd Coll. Pub. Mus., Quebec.

Platylabus ruficornis. Type. — Male, Harrington Coll. Pink label "P. 417." Lacks apices of antennæ. Allotype.—Female, yellow label 1211; blue-gray label 418. 2nd Coll. Pub. Mus., Quebec.

Platylabus scutellatus. Type.—Yellow label 195. 2nd Coll. Pub. Mus., Quebec.

Platylabus signatus. Type.—Not located.

Platymischus torquatus. Type.—Old rose label 53; yellow label 1337. 2nd Coll. Pub. Mus., Quebec. Badly glued.

Plectiscus gracilis. Type.—Female, yellow label 369. 1st Coll. Pub. Mus., Quebec. Good, but part of wings on pin.

Plectiscus niger. Type.—Male, yellow label 723. 2nd Coll. Pub. Mus., Quebec. Part of antennæ gone.

Podogaster radiolatus. Type.—Female, yellow label 482. 2nd Coll. Pub. Mus., Quebec. Antennæ broken at tip.

Podogaster sulcatus. Type.—Yellow label 1225. 2nd Coll. Pub. Mus., Quebec. Right antenna at scape and abdomen gone.

Polistes anaheimensis. Type.—Cat. No. 1978, U. S. Nat. Mus.

Polyblastus annulicornis. Type.—Male, yellow label 97, also yellow label 1243. 2nd Coll. Pub. Mus., Quebec. Provancher mistook sex.

Polyblastus decoratus. Type.—Male, blue label 486. 2nd Coll. Pub. Mus., Quebec.

Polyblastus dilatatus. Type.—Female, yellow label 334. 2nd Coll. Pub. Mus., Quebec. Lacks antennæ.

Polyblastus gaspesianus. Type.—Not located.

Polyblastus inornatus. Type.—Female, blue label 566. 2nd Coll. Pub. Mus., Quebec.

Polyblastus quebecensis. Type.—Female, yellow label 427. 1st Coll. Pub. Mus., Quebec.

Polysphincta acuta. Type.—Female, yellow label 393. 2nd Coll. Pub. Mus., Quebec. Lacks abdomen, apices of antennæ and apical joints of hind tarsi.

Polysphincta bruneti. Type.—Female, yellow label 710. 2nd Coll. Pub. Mus., Quebec.

Polysphincta cingulata. Type.—Yellow label 486. 1st Coll. Pub. Mus., Quebec. Only thorax, left wings and a set of legs present.

Polysphincta pleuralis. Type.—Not in Pub. Mus., Quebec, unless under *Bassus pulchripes* Prov.

Polysphincta rubricapensis. Type.—Female, yellow label 403. 2nd Coll. Pub. Mus., Quebec.

Polysphincta rufopectus. Type.—Not in Pub. Mus., Quebec, unless under *P. limata* Cress.

Polysphincta vicina. Type.—Male, unlabeled. 1st Coll. Pub. Mus., Quebec. Lacks flagellum. Stands with female bearing yellow label 394.

Pompilus apicatus. Type.—Female, yellow label 769. 2nd Coll. Pub. Mus., Quebec. Lacks left flagellum.

Pompilus castaneus. Type.—Male, yellow label 774. Name label *Pompilus argenteus* Cress. 2nd Coll. Pub. Mus., Quebec. Lacks apices of antennæ. Proved by Prov. Catalog.

Pompilus coquilletti. Type.—Male, Cat. No. 1980, U. S. Nat. Mus.

Pompilus griseus. Type.—Male, yellow label 1011. 2nd Coll. Pub. Mus., Quebec. Lacks antennæ, rather dirty.

Porizon albipes. Type.—Male, yellow labels 1554 (Prov.) and 150 (not Prov.). 2nd Coll. Pub. Mus., Quebec. Left antenna gone. Provancher mistook sex.

Porizon angulare. Type.—Male, yellow label 452. 2nd Coll. Pub. Mus., Quebec. Left antenna broken near base.

Porizon boreale. Type.—Female, yellow label 370. 1st Coll. Pub. Mus., Quebec. Head and left fore leg missing.

Porizon californicum. Type.—Male, small, square, white labels 34 and 2 (s); yellow label 1480. 2nd Coll. Pub. Mus., Quebec. Right antenna at scape, left at middle, and left hind wing, gone.

Porizon elongatum. Type.—Male, yellow label 1226. 2nd Coll. Pub. Mus., Quebec.

Porizon rugosum. Type.—Male, yellow label 445. 2nd Coll. Pub. Mus., Quebec. Antennæ broken near middle.

Posocentrus huarti. See *Phœogenes huarti.*

Praon simulans. Type.—See introduction (Aphidiinæ).

Prionony x canadensis. Type.—Male, yellow label 1070. 2nd Coll. Pub. Mus., Quebec.

Proctotrupes flavipes. Type. — Yellow label 618. 2nd Coll. Pub. Mus., Quebec.

Proctotrupes rufigaster. Type.—Female, yellow label 641. 2nd Coll. Pub. Mus., Quebec.

Prosapha hyalina. Type.—Male, yellow label 1586. 2nd Coll. Pub. Mus., Quebec. Right antenna at scape, wings on right and legs on right, except fore and hind femora, gone.

Pteromalus acutus. Type.—Yellow label 922. 2nd Coll. Pub. Mus., Quebec. Badly glued.

Pteromalus nigricornis. Type.—Yellow label 1602. 2nd Coll. Pub. Mus., Quebec. Badly glued.

Pteromalus pieridis. Type.—Yellow label 628. 2nd Coll. Pub. Mus., Quebec.

Pyracmon annulatum. Type.—Yellow label 524. 2nd Coll. Pub. Mus., Quebec. Left antenna at scape, right at middle, posterior legs except right coxa, and abdomen gone.

Pyracmon incompletum. Type.—Female, yellow label 1224. 2nd Coll. Pub. Mus., Quebec.

Pyracmon macrocephalum. Type.—Female, yellow label 305. 2nd Coll. Pub. Mus., Quebec. Antennæ gone.

Pyracmon rufum. Type.—Female, yellow label 1031. 2nd Coll. Pub. Mus., Quebec. Lacks apex of left flagellum.

Radiolaria clavata. Type.—Blue label 742(s); yellow label 1290. 2nd Coll. Pub. Mus., Quebec. Tag-mounted, right antenna broken at tip.

Rhogas quebecensis. Type.—Female, yellow label 545. 2nd Coll. Pub. Mus., Quebec.

Rhogas rugosulus. Type.—Female, yellow label 1567. 2nd Coll. Pub. Mus., Quebec. Lacks ovipositor and most of legs.

Rhogas sancti-hyacinthi. Type.—Female, yellow label 546. 2nd Coll. Pub. Mus., Quebec. Antennæ broken at tips.

Rhopalicus pallipes. Type.—Not located.

Rhopalophorus. See Eustalocerus.

Ropronia pediculata. Type.—Blue label 314, yellow label 1278. 2nd Coll. Pub. Mus., Quebec. Lacks abdomen.

Roptrocerus (sic) rectus. Type.—Yellow label 1386. 2nd Coll. Pub. Mus., Quebec. Badly glued.

Sapyga maculata. Type.—Female, yellow label 754. 2nd Coll. Pub. Mus., Quebec.

Sciapteryx punctum. Type.—Yellow label 480. 2nd Coll. Pub. Mus., Quebec. Lacks hind tarsi.

Scotioneurus dives. Type.—See introduction (Aphidiinæ).

Scotioneurus stenostigma. Type.—See introduction (Aphidiinæ).

Selandria canadensis. Type.—Female, yellow label 1148; name label "Hoplocampa canadensis Prov." 2nd Coll. Pub. Mus., Quebec. Proved by Provancher Catalog.

Selandria flavicornis. Type.—Male, yellow label 60, name label "Selandria halcyon Harris." 2nd Coll. Pub. Mus., Quebec. Lacks flagellum. See introduction.

Selandria marginata. Type.—Harrington Coll. Flagellum wanting.

Selandria paupera. Type.—Yellow label 696. 2nd Coll. Pub. Mus., Quebec.

Semiotellus cupræus. Type.—Yellow label 920. 2nd Coll. Pub. Mus., Quebec.

Semiotellus fasciatus. Type.—Yellow label 226. 2nd Coll. Pub. Mus., Quebec. Fair.

Semiotellus fuscipes. Type.—Female, yellow label 918. 2nd Coll. Pub. Mus., Quebec.

Semiotellus melanicrus. Type.—Female, yellow label 627. 2nd Coll. Pub. Mus., Quebec. Fair.

Semiotellus minimus. Type.—Yellow label 921. 2nd Coll. Pub. Mus., Quebec. Fair.

Semiotellus oblongus. Type.—Female, yellow label 919. 2nd Coll. Pub. Mus., Quebec.

AN ANNOTATED LIST OF THE CERAMBYCIDÆ OF CALIFORNIA. (COL).

BY RICHARD T. GARNETT, UNIVERSITY OF CALIFORNIA, BERKELEY, CAL.

Not having noticed of late any list of California Cerambycidæ in any publication, I submit the following annotated list of that favourite family of collectors, the information gleaned from many fields and the note-books of many workers and collectors.

Acknowledgements are due to many of the Pacific Coast entomologists, for the greater part of the data on the insects contained in this list were obtained from their experience, particularly from Dr. Edwin C. Van Dyke. Several workers have kindly allowed me to examine their series, and a wider range of dates and localities has thus been obtained.

Many of the species I have collected in the various parts of the State during the past four years, a trip to Donner Lake and the surrounding section of the Sierras having been especially fruitful of results. Many others are unrepresented in my collection, but the data in this list on them has been procured from the collections and notes of others.

The longicorns of Lower California are included in the list because some of them are sometimes found not far from our borders, and may some day, or may have already, unknown to collectors, spread their territory into California proper.

Any changes in synonymy were suggested by Dr. E. C. Van Dyke last year while he was still on this coast. Examples of such changes are seen in numbers 100 and 69 of this list.

1. *Ergates spiculatus* LeConte.

   This is found in Northern California and the Sierras. Taken by author at Donner Lake from pupal cells in yellow pine; also breeds in other coniferous trees. June 20–August 7.

2. *Mallodon mandibularis* Harold.

   This probably occurs near Yuma, and is also found at San José del Cabo, Lower California.

3. *Mallodon melanopus* Linné.

   This was taken from pupal cells beneath bark of mesquite near Indio, Riverside County.

4. *Derobrachus geminatus* LeConte.
   This was taken at Palm Springs, Riverside County. Also present in Lower California. May 30.

5. *Prionus californicus* Motschulsky.
   This is found throughout the State and works on the roots of the coast live oak, *Quercus agrifolia*. Common. May 22–October 8.

6. *Tragosoma depsarium* Linné [*harrisii* Leconte].
   This works on tamarack and yellow pine in the Sierras, and is also found about other coniferous trees on several of which it is supposed to work. Taken by the author at Donner Lake beneath the bark of *Pinus ponderosa*. July 2.

   Tragosoma pilosicornis Casey.
   This is nothing more than a form of *T. depsarium*. Found on Mount Diablo.

7. *Asemum atrum* Eschscholtz.
   This is very common in the northern part of the State and in the Sierras. This opaque species breeds in the Douglas Spruce (*Pseudotsuga taxifolia*). I took it abundantly early in July at Donner Lake and Tahoe Tavern. July 3–28.

8. *Asemum nitidum* LeConte.
   At Monterey this works on *Pinus radiata*. It is also found in the Middle Sierras, Yosemite, and Tahoe. I have taken it along with *atrum* at Donner Lake and Tahoe Tavern. June 17–July 21.

9. *Nothorina aspera* LeConte.
   This most probably works in coniferous trees. Found in Siskiyou County.

10. *Criocephalus productus* LeConte.
    This beetle is found commonly throughout the northern part of the State, though but few specimens have been taken in Southern California. It works on *Pseudotsuga taxifolia*, and is supposed to work on grape-vine roots also. May 7–August 2.

11. *Criocephalus asperatus* LeConte.
    This is found in the northern part of the State and the Sierras. It has been found flying around alpine fir. It probably breeds in coniferous trees, especially firs and spruces. July 20.
12. *Tetropium velutinum* LeConte.
    This breeds in *Pseudotsuga taxifolia* and is moderately common in spruce forests north of San Francisco. A variety is found in the Giant Forest, Tulare County. June 1–August 9.
13. *Opsimus quadrilineatus* Mannerheim.
    This breeds in *P. taxifolia* and is found from Alaska to San Francisco Bay. It probably also breeds in Sitka Spruce (*Picea sitchensis*).
14. *Dicentrus bluthneri* LeConte.
    This is found in coast counties north of San Francisco and also rarely in the Sierras, near coniferous trees.
15. *Hylotrupes amethystinus* LeConte.
    This is found in the Sierras from Shasta to Mt. San Bernardino, rarer in the South. Breeds in *P. ponderosa* and *Libocedrus decurrens*. Taken in numbers at Tamarack, Nevada County by the author. July 2.
16. *Hylotrupes ligneus* Fabricius.
    Found through the Sierras, also in the Coast Range to Monterey. Taken by author on July 1 at Donner Lake. This breeds in *P. taxifolia* in the Sierras, *Pinus radiata* at Monterey, and probably in the sapwood of *Sequoia sempervirens* also.
17. *Hylotrupes litigiosus* Casey.
    This so-called dark variety is a good species (teste Van Dyke). It breeds in the Sierra Fir near Forest Hill, Placer County.
18. *Phymatodes variabilis* Fabricius.
    This is only found occasionally in imported wood.
19. *Phymatodes blandus* LeConte.
    This is rarely found in Northern California. Supposed to breed in grape vine. July 16.

20. *Phymatodes obscurus* LeConte.
This is found throughout the State, and has been taken by the author at Auburn and Calistoga in August and May, respectively. It breeds in *Quercus agrifolia*. Has been reared from tan oak in Marin County by L. S. Smith, and from *Quercus lobata* in the Sonoma Valley by A. E. Wieslander. May 25–November 8.

21. *Phymatodes aeneus* LeConte.
This feeds on *P. taxifolia* and is found north of San Francisco.

22. *Phymatodes dimidiatus* Kirby.
This is a northern species, running over into this State in Trinity County. It breeds in *P. taxifolia*. July 2–August 23.

23. *Phymatodes vulneratus* LeConte.
This is quite rare, and probably breeds in oak and other soft woods. Has been beaten from *Q. agrifolia* by Van Dyke.

24. *Phymatodes varius* Fabricius.
Found from San Francisco Bay north. In Sonoma County it breeds in *Pseudotsuga taxifolia* and *Pinus radiata*. June 24.

25. *Phymatodes decussatus* LeConte.
Has been reared from white valley oak in Northern California. June 26.

26. *Phymatodes nitidus* LeConte.
Found from San Francisco Bay north. Reared from *Cupressus macrocarpa* by Nunenmacher and myself, from the sapwood of *Sequoia sempervirens* and *P. taxifolia* by Van Dyke. May 21.

27. *Phymatodes juglandis* Leng.
Taken from California walnut in Los Angeles County by Coquillett.

28. *Callidium antennatum* Newm.
This breeds in most coniferous trees, often being taken from *P. taxifolia*. Taken at San Francisco and north, also throughout the Sierras and in the San Bernardino

Mountains. Taken in abundance by the author at Willits in July. May 20–July 11.

29. *Callidium hirtellum* LeConte.
Found in the Sierras. Beaten from *P. taxifolia*, and also found about twigs of *Pinus ponderosa*. June 25–August 29.

30. *Callidium vile* LeConte.
Found near San Francisco and north. Is very rare. July 4.

31. *Xylocrius agassizii* LeConte.
This is rare in California and is a coast species. Works on gooseberry and has been beaten from willow by Van Dyke.

32. *Xylocrius cribratus* LeConte.
This is rare in California and is a Sierran species. July 17.

33. *Malacopterus lineatus* Guer.
Found along the Colorado River and out from Fort Yuma.

34. *Oeme costata* LeConte.
Found in Sierras. One taken by Van Dyke in Yosemite.

35. *Oeme strangulata* Horn.
Have no records regarding this species.

36. *Oeme gracilis* LeConte.
This has been taken by Fall and Van Dyke from Catalina Island and Los Angeles County.

37. *Eudistenia costipennis* Fall.
Five specimens have been taken by Dr. Fenyes and H. C. Fall near the summit of the Sierra Madre Mountains above Pasadena, and one by Baker near Claremont, being beaten from live oak, in which the insect probably breeds.

38. *Eucrossus villicornis* LeConte.
Found in Nevada, Arizona, and Inyo County, California. Fall has taken one in the San Bernardino Mts. Reported as attracted to light by Nunenmacher.

39. *Haplidus testaceous* LeConte.
One specimen has been taken by Van Dyke in Nevada County.
40. *Achryson surinamum* Linné.
Found normally in Southern Arizona; probably occurs in the Colorado desert. June 10–July 18. (Dates for Arizona).
41. *Hammaticherus mexicanus* Thomson.
Found at Cape San Lucas, Lower California.
42. *Brothylus gemmulatus* LeConte.
This has been taken by Van Dyke on the beach at San Francisco and at Mt. Wilson, Los Angeles County.
43. *Brothylus conspersus* LeConte.
This rarity has been taken by Kusche on dead white valley oak in Sonoma County. It is found about San Francisco Bay and north.
44. *Osmidus guttatus* LeConte.
Taken at San José del Cabo, Lower California.
45. *Gnaphalodes trachyderoides* Thomson.
Taken at San José del Cabo, Lower California.
46. *Eburia ulkei* Bland.
Taken at Cape San Lucas, Lower California.
47. *Eburia conspersa* Horn.
Found at San José del Cabo, Lower California.
48. *Romaleum simplicolle* Hald.
Taken on Catalina Island by H. C. Fall, and at Santa Monica by E. C. Van Dyke.
49. *Romaleum seminitidum* Horn.
Taken by H. C. Fall along the Colorado River.
50. *Elaphidion punctatum* LeConte.
Taken at Cape San Lucas, Lower California.
51. *Elaphidion imbelle* LeConte.
Found in Sonoma and San Diego Counties. Has been bred by Dr. Blaisdell from live oak. June 16–August 3.
52. *Elaphidion albofasciatum* Linnell.
Taken by Coquillett in the foothills along the southern border of the Mojave Desert.

(To be continued)

KEY TO THE NORTH AMERICAN SPECIES OF AGROMYZA RELATED TO *SIMPLEX* LOEW (DIPTERA).

BY J. R. MALLOCH, URBANA, ILL.

The species in this group are distinguished from their allies by the following combination of characters: Body entirely black, with sometimes a metallic bluish or greenish tinge, halteres black, costa ending at or slightly beyond apex of third vein.

Only five species are known to me, one of which is undescribed.

KEY TO SPECIES.

1. Mesonotum with 3 pairs of dorso-centrals.....2
   Mesonotum with 2 pairs of dorso-centrals.....3
2. Orbits distinctly shining; 5 pairs of orbitals present; anterior pair of dorso-centrals weak. Larvæ in twigs of willow. N. Y.; Ill.....*salicis* Malloch.
   Orbits opaque; 7 pairs of orbitals present; all 3 pairs of dorso-centrals strong. Food-plant unknown.....*tamia* Melander.
3. Abdomen with a distinct bluish tinge; cheek almost linear, not over one-eighth as high as eye. Food-plant unknown. Md.....*winnemanæ* Malloch.
   Abdomen glossy black, or at least without bluish tinge; cheek about one-fourth as high as eye.....4
4. Outer cross-vein about half its own length from inner; wings barely more than twice as long as broad; frontal and facial orbits glossy. Larvæ mining in stems of asparagus. N. J.; N. Y.; Va.; Ill.; Europe.....*simplex* Loew.
   Outer cross-vein at its own length from inner; wings about 2.5 times as long as broad; frontal orbits very slightly shining, facials opaque. Food-plant unknown. Ill.....*similata* Malloch.

Male.—Black; head opaque, orbits and triangle slightly shining, thorax and abdomen distinctly shining. Wings clear, veins black. Squamæ fuscous, fringes black. Halteres black.

Frons over one-third the width of head; ocellar triangle poorly defined, extending almost to anterior margin of frons; posterior

ocelli separated by nearly twice the distance between anterior and posterior ocelli; orbits narrow, about one-sixth as wide as interfrontalia; orbital bristles short, 4 in number, hairs weak and sparse; antennæ small, third joint rounded in front; arista bare, slightly swollen and pale at base, its length slightly greater than anterior width of frons; cheek one-fourth as high as eye, marginal hairs weak, more numerous anteriorly, vibrissa weakly differentiated. Mesonotum with 2 pairs of dorso-centrals; discal setulæ becoming sparse posteriorly and not continued to posterior dorso-centrals; prescutellars absent; basal pair of scutellars stronger than apical pair. Apical abdominal segment 2.5 times as long as preceding segment; hypopygium larger than in allied species. Legs rather slender; mid tibiæ with very weak posterior setulæ. Inner cross-vein below apex of first; outer cross-vein at its own length from inner; apical sections of third and fourth veins slightly divergent apically; ultimate section of fourth vein about six times as long as penultimate; last section of fifth vein about four-fifths as long as preceding section; sixth vein very distinct, ending at one-third from margin of wing.

Length 2 mm.

Type locality, Dubois, Ill., May 24, 1917 (J. R. Malloch).

Food-plant unknown.

BOOK NOTICE.

Biology of the Membracidæ of the Cayuga Lake Basin. By W. D. Funkhouser, Memoir 11, Cornell University Agricultural Experiment Station. Pp. 177–445, 44 plates. Ithaca, N.Y., June, 1917.

In this study Mr. Funkhouser has given us a valuable summary of his work on the Membracid fauna of the Cayuga Lake Basin, together with an excellent introduction to the general study of this attractive family.

The first part of the paper contains a useful general description of the geology, physiography and climatology of the district, and its characteristics as a faunal and floral area, followed by an account of the local Membracid fauna, the distribution of which

is considered with reference to a number of somewhat arbitrary stations into which the region is divided for convenience. Some general matters are also touched upon in this connection, such as the theories of origin of the family, paths of migration, and the general distribution of the group throughout the world. "In North America the family is best represented in Mexico, where the characteristic bizarre forms are plentiful. Southern United States shows fewer species, and these lose their grotesque appearance as they spread northward. Northern United States continues to show the thinning out of the forms as the climate becomes colder, and the native species are, on the whole, smaller and of less striking development. Canada marks the northern limit of the family and shows few representatives."

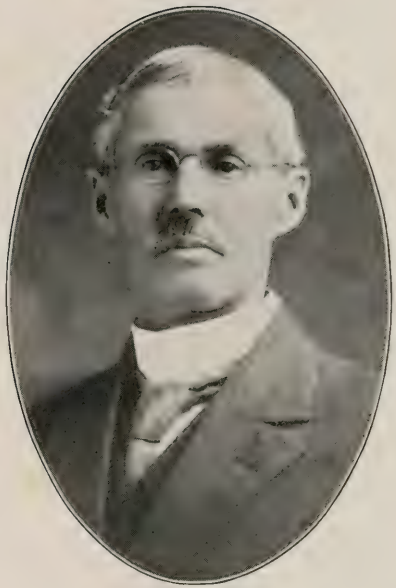
The greater part of the paper is taken up with the descriptions, bibliography and notes on the life-histories of the sixty-one species of the district, all of which are figured, the early stages as well as the adult characters being shown in many cases. There are also keys to the subfamilies, genera and species.

Following this descriptive list a number of general matters are discussed. These include a detailed account of the external anatomy, which although approached mainly from the taxonomic viewpoint will doubtless prove useful to the morphological student as well as the systematist.

The concluding portion of the book is occupied by an interesting account of the general features of the life-history, habits, host relations, ecology, etc., of the family. Among the more interesting features of their habits are those of oviposition, of which there are a number of rather distinct types. This subject is of some interest from the economic standpoint, since the only kind of real injury caused by any of the species is due to the egg-laying habit, as in the well-known case of *Ceresa bubalus*. Even this injury, however, is exceptional, and the Membracidæ are not to be regarded as of any great economic importance.

This study will be useful, not only to Hemipterists and general entomologists, but also to anyone interested in the faunal characteristics of the Cayuga Lake Basin and neighboring or similar regions.

Mailed May 10th, 1918.



W. Hague Harrington

The Canadian Entomologist.

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OBITUARY.

William Hague Harrington.

In the death of William Hague Harrington, which occurred at Ottawa, on March 13, 1918, the Entomological Society of Ontario lost one of its oldest members. Mr. Harrington was not only a distinguished entomologist but he was also a capable botanist, as well as the possessor of a fund of knowledge on natural history generally.

Born at Sydney, Cape Breton, N.S., on April 19, 1852, he was thus almost 66 years old when he died. His early education was received at a private school. Later he entered the Sydney Academy, distinguishing himself in all lines of study, particularly in mathematics. In 1870, he left Nova Scotia for Ottawa and in November of that year entered the Federal Civil Service, receiving an appointment in the Post Office Department. Here his ability was soon recognized, and from one promotion to another he was, in 1908, appointed Superintendent of the Savings Bank Branch, an important position in the above department. In June, 1916, after 45 years of public service he was granted superannuation, and being thus relieved of official duties, he looked forward to being able to devote himself more fully to entomological studies. Unfortunately, however, this was not to be. More recently, particularly during the past two years, a continued anaemic condition gradually undermined his system. The cold Ottawa winters were felt keenly by him, and during the summers his strength was not sufficient to allow him to undertake any important collecting or other work. Last November his condition became decidedly more serious and he was compelled to take to his bed. About that time too, he had a slight paralytic stroke. During the past winter, paralysis increased gradually and this with profound anaemia finally caused death.

In 1879, Mr. Harrington, with several other naturalists founded the Ottawa Field-Naturalists' Club, and was chosen as a member of the Committee. In 1880 he was elected Secretary-

Treasurer of the Club. In the following year he was re-elected to the same position, and in 1882, the position being divided, he was elected Secretary, which office he continued to hold until March, 1885. In that month he was honoured by being elected President of the Club.

In 1879, Mr. Harrington was also elected to the Council of the Entomological Society of Ontario; in 1891 he was chosen as first Vice-President, and from 1893 to 1895 he acted as President. For a number of years he was also a member of the Editing Committee of the Canadian Entomologist.

In 1894 he was honoured by the Royal Society of Canada, by being elected a Fellow.

The writer first met Mr. Harrington in 1899, and from that time on had the pleasure of meeting him frequently and experiencing the joy of knowing him intimately. This was made possible by that prince of good fellows, the late James Fletcher, who in winter generally arranged for a Saturday afternoon snowshoe tramp or other outing with a "camp" tea at half past six in his unoccupied (during winter) residence on the Central Experimental Farm; a friendly smoke followed, and a brisk walk of a couple of miles to the city in the evening. Harrington and the writer missed few of these pleasures.

Quiet in nature and unassuming, even retiring at times, Harrington was held in high regard by all who knew him. Early in life he became interested in natural history. His chief studies were in the Hymenoptera. He was one of the few English-speaking entomologists who enjoyed a close correspondence with that eminent French-Canadian entomologist l'Abbé Provancher. He also corresponded freely with W. H. Ashmead. During his residence in Ottawa, Harrington amassed an important collection of Coleoptera and Hymenoptera; among the latter are the types of his own species. In addition to being a systematist of recognized standing, he was also keenly interested in economic entomology, being an Active Member of the Association of Economic Entomologists.

At a meeting of the Council of the Entomological Society of Ontario, held in March last, the following letter signed by the

President and Secretary, respectively, was adopted and afterwards forwarded to Mrs. Harrington:

"The members of the Executive Council of the Entomological Society of Ontario desire to express their profound sympathy with you in the loss that you have sustained through the death of your husband, Mr. William Hague Harrington. For more than forty years he was a member of this Society and took an active interest in its welfare and shared in its work. He was regarded not only in Canada, but in the United States as well, as a thoroughly scientific entomologist, whose published contributions were distinguished by their painstaking accuracy and the many original observations contained in them. He was justly considered to be the highest authority upon hymenopterous insects in the Dominion of Canada. We deplore his loss to science and to our Society, and grieve at the removal of a colleague and friend."

The Ottawa Field-Naturalists' Club on March 15 resolved as follows:

"The Council of the Ottawa Field-Naturalists' Club has learned with deep regret of the death on Wednesday, March 13, of Mr. William Hague Harrington, F.R.S.C. Mr. Harrington was known and highly respected by entomologists, botanists and other scientific men, not only in Canada but throughout the United States as well. His studies, particularly on certain families of insects, had given him a wide reputation, and in his death the science of entomology particularly has lost a devoted worker. As a former Secretary and Past President of the Club he was held in high regard by our members."

The following is a list of Harrington's more important writings:

In the Canadian Entomologist:

Entomology for Beginners—Some Wood Eaters; 1880, 95, 258;

Field Notes; 1881, 7;

Entomology for Beginners—Long-stings; 1882, 81;

Notes on the occurrence of some species of Uroceridæ; 1882, 224;

Variations in markings of *Cicindela sexguttata;* 1883, 239;

Additions to Canadian lists of Coleoptera; 1884, 44, 70, 96, 117;
Larva of Dolba hylæus; 1884, 54;
Entomology for Beginners—Notes on a June Ramble; 1884, 101.
Notes on Tenthredinidæ, 1885; 1886, 38;
Note on *Oryssus sayi;* 1886, 30;
Tenthredo (?) *delta* Prov.; 1886, 32;
Notes on *Xiphydria albicornis;* 1886, 45;
Oryssus sayi Westwood; 1887, 81;
Hints on Collecting Hymenoptera; 1887, 115;
The Nuptials of Thalessa; 1887, 206;
Further Observations on *Oryssus sayi;* 1887, 239;
New Species of Canadian Tenthredinidæ; 1889, 95;
Ibalia maculipennis Hald.; 1889, 141;
Tenthredinidæ Collected at Ottawa, 1899; 1890, 23;
Two Interesting Monstrosities; 1890, 124;
On the lists of Coleoptera published by the Geological Survey of Canada, 1842 to 1888; 1890, 135, 153, 184;
Notes on a few Canadian Rhyncophora; 1891, 21, 114;
Two species of Canadian Pimplinæ; 1891, 132;
Note on *Amblyopone pallipes* Hald.; 1891, 138;
Platynus New to Canada; 1891, 115;
Additional Note on *Amblyopone pallipes* Hald.; 1892, 76;
Canadian Hymenoptera; 1892, 98;
Two Distinguished Settlers; 1892, 112;
Obituary; Abbé Provancher; 1892, 130;
A New *Ischalia* from Vancouver Island; 1892, 132;
Canadian Hymenoptera; 1893, 29, 57;
An Entomological Trip to Copper Cliff, Ont.; 1894, 9;
A Teratological Trio; 1894, 86;
Canadian Hymenoptera; 1894, 193, 209, 245;
Staphylinus cæsareus Cederh. and *S. erythropterus* Linn. in Canada; 1894, 356;
Notes on Hymenoptera; 1895, 155;
Occupants of the Galls of *Eurosta solidaginis* Fitch; 1895, 197;
Canadian Hymenoptera, No. 7; 1896, 75;
A Canadian *Triogonalys;* 1896, 108;

Catalogue of the Phytophagous and Parasitic Hymenoptera of Vancouver Island; 1897, 16, 43;
Six New Ottawa Proctotrypidæ; 1899, 77;
A Few Canadian Longicorns; 1899, 107;
Notes on Bæus; 1901, 331;
Note on *Pityopthorus coniperda;* 1902, 72;
A Canadian *Anoplonyx;* 1902, 93;
Arctic Siricoidea and Tenthredinoidea; 1903, 15;
Male Wasp with Female Antennæ; 1903, 37;

In the Reports of the Entomological Society of Ontario:

Rhyncophora—Weevils; 1880, 80;
Some Fungi Eaters; 1881, 22;
Long-stings; 1882, 23;
House-flies; 1882, 38;
Chrysomelidæ—Leaf-eaters; 1882, 53;
Insects Collected in 1882; 1883, 35;
A New Foe to the Maple; 1883, 40;
Injurious Insects Affecting the Hickory; 1883, 42;
Notes on a June Ramble; 1884, 30;
Saw-flies (Tenthredinidæ); 1884, 63;
Hymenoptera Aculeata—Ants, Wasps, and Bees; 1885, 48;
Insects Infesting Maple Trees; 1886, 22;
The Nuptials of Thalessa; 1887, 25;
Hints on Collecting Hymenoptera; 1887, 43;
Hymenoptera Parasitica; 1890, 64;
Notes on Japanese Insects; 1891, 90;
Obituary Notice of the Abbé Provancher; 1892, 88;
Annual Address of President; 1893, 17;
Canadian Uroceridæ; 1893, 49;
Additional Notes on Japanese Insects; 1893, 50;
Notes on a Few Canadian Coleoptera; 1894, 47;
Annual Address of the President; 1894, 9.
Some Winter Insects from Swamp Moss; 1895, 47;
Some Beetles Occurring Upon Beech; 1896, 69;
Notes on the Insects of the Year 1897; 1897, 30;
Notes on Insects of the Year in Ottawa District, 1898, 87;
Notes of Insects of the Year in Ottawa District, 1899, 94;
Notes on Insects Injurious to Pines; 1902, 114;

Hymenoptera; 1902, 99;
Diptera; 1902, 101;

In the Transactions of the Ottawa Field-Naturalists' Club:

On Some Insects Captured During our Excursions; 1880, 41;
On Some Coleoptera Injurious to our Pines; 1881, 28;
List of Ottawa Coleoptera, with Introduction to Order—In this article 1,003 species are listed; 1884, 67;
Our Saw-flies and Horn-tails; 1884, 244;

In the Ottawa Naturalist:

Note on Flour and Grain Beetles; 1887, 133;
Fauna Ottawaensis—Hemiptera—About 200 species listed; 1892, 25;
Entomology—Edited by W. H. Harrington; 1892, 84, 103, 113, 150, 168;
List of Coleoptera from Cypress Hills, N.W.T., 1892, 149;
Fauna Ottawaensis—Hymenoptera Phytophaga; 1893, 117;
Hymenoptera Phytophaga, 1893; 1893, 162;
Fauna Ottawaensis—Hemiptera—additional list; 1894, 66;
Unusual Abundance of Meloid Larvæ; 1895, 90;
Ottawa Spiders; 1896, 11;
Ottawa Spiders and Mites; 1897, 190;
Fauna Ottawaensis; Hymenoptera Parasitica—Proctotrypidæ; 1897, 174, 217;
Ottawa Coleoptera—Cerambycidæ; 1899, 57;
Extra-limital Insects Found at Ottawa; 1899, 117;
Fauna Ottawaensis—Diptera—234 species listed; 1900, 127;
Fauna Ottawaensis—Hymenoptera: Superfamily *II*—Sphegoidea; 1902, 215;
Fauna Ottawaensis—Hymenoptera: Superfamily *III*—Vespoidea; 1908, 69;
Reminiscenses of Dr. Fletcher; 1909, 196;

In the Transactions of the Royal Society of Canada:

Canadian Uroceridæ; 1893, 131;
Catalogue of Canadian Proctotrypidæ, 1899, 169;

In the Naturaliste Canadien:

Souvenirs Entomologiques, XXVI, 65, 106.

In addition to the above, short notes, reviews, etc., were published, as well as important articles on subjects other than

entomological. His last article, "Notes on Some Ottawa District Plants" (11 pp.) was published in the February, 1917, issue of The Ottawa Naturalist. He was certainly an excellent student and most careful writer. His writings have indeed enriched our knowledge of Canadian Entomology.

His wife, one son and one daughter survive him. To them we extend our deepest sympathy in their sad bereavement.

ARTHUR GIBSON.

POPULAR AND PRACTICAL ENTOMOLOGY.

EXPERIMENTS WITH CUTWORM BAITS.*

BY JOHN J. DAVIS AND C. F. TURNER, LAFAYETTE, INDIANA.

In the Emergency Entomological Service of the United States Department of Agriculture, No. 5, Sept. 1, 1917, we reported experiments to determine the suitableness of sawdust as a filler for cutworm and grasshopper poison baits in place of the increasingly expensive wheat bran. Briefly these results were as follows: Tests were made at Johnson, Indiana, in a corn field infested with so-called "over-flow worms" (*Agrotis ypsilon*). Here the regulation bran mash, that is 1 lb. poison to 25 lbs. filler (sawdust or bran), 2 quarts molasses, six lemons and water as needed. Three formulæ were used. Paris green and bran, Paris green and sawdust, and white arsenic and bran, and these were scattered broadcast at the rate of 5 lbs. per acre. The ground thus treated July 9 was re-planted to corn July 14, and counts were made July 23, with the following results:

Paris green and bran	2% plants cut.
Paris green and sawdust	5% plants cut.
White arsenic and bran	3% plants cut.
Check	50% plants cut.

Similarly at Akron, Indiana, experiments were conducted with Paris green and bran and Paris green and sawdust for the control of the army worm (*Cirphis unipuncta*). Two strengths

*Published by permission of the Secretary of Agriculture.

were used in each case, viz., 1 pound to 25 of filler and 1 pound to 50 of filler, the bait being scattered broadcast at the rate of 10 lbs. per acre. The applications were made late one evening, and counts made the following morning with the following results:

Paris green and bran, 1–25.....76.3% worms dead.
Paris green and bran, 1–50.....65.7% worms dead.
Paris green and sawdust, 1–25.....55.5% worms dead.
Paris green and sawdust, 1–50.....57.1% worms dead.

Examinations made two days after the application showed approximately 75% value in the sawdust bait area and practically all were dead in the bran bait area, and approximately the same results were obtained by using these baits in the furrow plowed around the field.

The continuation of these experiments has been possible through the courtesy of Prof. C. G. Woodbury, Director of Purdue Agricultural Experiment Station, who placed at our disposal space in the station greenhouse and during the months of January and February, 1918, 95 individual experiments were conducted with a view to determining the relative value of sawdust in comparison with bran, different kinds of arsenicals, and varying formulæ. The insect used in these tests was the common army worm (*Cirphis unipuncta*) and the method adopted was somewhat as follows: enamel trays 4 x 8 and 3″ deep were used, these being banded on the inside with tree tanglefoot to prevent escape of worms. Twelve army worms were used in each cage, and a small amount of poison material together with a similar amount of a comparable bait unpoisoned and wheat foliage was placed in the cage, giving the worms every possible opportunity to utilize the unpoisoned bait or foliage if they so desired. The results may be summarized as follows: Of the 18 individual experiments representing 216 larvæ, where the comparative value of bran and sawdust was tested, we found 52.5% of the worms killed where sawdust was used as a filler and 86.1% where bran was used. In the same number of experiments testing a half and half bran and sawdust mixture in comparison with bran alone we found 72.5% killed where the combination was used, and 90.7% where bran alone was the filler.

Table 1. Value of substitutes for bran in poison bait.

Bran Versus Sawdust.				Bran Versus Sawdust and Bran.			
Number Expts.	Number larvæ represented	Per cent. Killed with		Number Expts.	Number larvæ represented	Per cent. Killed with	
		Sawdust bait	Bran bait			Sawdust & bran bait	Bran bait
18	216	52.7+	86.1+	18	216	72.5	90.7+

It is thus evident that bran is noticeably superior to sawdust alone and even the combination of sawdust and bran, but these laboratory experiments in connection with the field experiments at Johnson and Akron, Indiana, show that sawdust does have some value and can be recommended where it is impossible or very difficult to obtain bran but where it is used, a second application will probably be necessary and a combination with some bran which will prevent the mixture from scattering into too fine particles and drying quickly, is preferable.

Three kinds of sawdust were used: viz., old hardwood (oak and hickory), new hardwood (hickory) and pine. The pine sawdust seemed to have a decided repellant effect and should not be used as a filler for the poison bait. In comparing new and old hardwood sawdust we found a larger percentage killed where the new was used, but our comparative tests with these materials are not sufficient to draw satisfactory conclusions. The new hardwood (hickory) was used in all experiments in comparison with bran.

The most important data obtained was a comparison between Paris green and other arsenicals. In the total number of experiments where Paris green was used, 16 in number, we killed 75.8% while calcium arsenate in 5 experiments killed 70%; sodium-arsenite in 4 experiments killed 80.8%; lead arsenate in 3 experiments, 85.8; arsenous acid (white arsenic) in 2 experiments gave 20.8%, and crude arsenous acid, a by-product of copper refineries which contained 88% of arsenous oxid, killed in 14 experiments 74.4%. It might be stated that these materials were used 1 lb. to 40 of filler, excepting in one experiment with crude arsenous oxid and one experiment with arsenous acid where it was used 1-25, and in all three experiments with lead arsenate where it

was used at the rate of 1–20. The checks in these experiments gave a death rate of 11.6%.

Table 2. Effectiveness of poisons.

Arranged in order of value according to combined effectiveness and rapidity of killing.

Filler used	Sodium arsenite 1–40	Paris green 1–40	Crude arsenous 1–40	Calcium arsenate 1–40	Lead arsenate 1–20	Arsenous acid	Check
Bran	100	90	80.2+	86.1+	79.1+	33.3+ (1–25)	14.5+
Bran and sawdust	75	75	72.2+	41.6+	100	———	12.5
Sawdust	50	52.7+	41.6+	50	———	8.3+ (1–40)	12.5
Total average	80.8+	75.8+	74.4+	70	85.8+	20.8+	11.6+

Analyzing further these results and especially comparing the value of Paris green with crude arsenous oxid we find that in three experiments where sawdust was used, the Paris green killed 52.7%; in three experiments with sawdust and bran it killed 75%, and in ten experiments where bran alone was used 90%, while the experiments with crude arsenous oxid killed, in two experiments where sawdust was used, 41.6%; in three experiments where sawdust and bran was used, 72.2%, and in eight experiments where bran was used 80.2%. Where crude arsenous oxid was used, 1–40, which was the same strength as Paris green, we have a killing power very slightly in favour of Paris green, and it might be stated in this connection that crude arsenous oxid was used even as weak as 1–60 pounds of filler with very satisfactory results, and when used at the rate of 1–25 it was remarkably effective.

In interpreting these results we must consider not only the ultimate effectiveness of the individual poisons but also the rapidity with which they kill. In analyzing the results from this point of view, we find that Paris green, crude arsenous oxid and sodium arsenite killed with approximately the same degree of rapidity, sodium arsenite being a little more prompt in its action than either of the other two. During the first two days of the experiment, calcium arsenate was slower in action but in most cases

caught up with the other poisons within two and one-half days. Arsenate of lead was much slower than any of the four poisons mentioned above, although ultimately, that is at the end of five or six days, was more effective than the other poisons, although it must be remembered that the arsenate of lead bait was used twice as strong as the other poisons. Arsenous acid (white arsenic) gave the poorest results, for it was not only much slower in action but its accumulative effect was inappreciable.

Summarizing our results with poisons we can conclude that Paris green, crude arsenous oxid and sodium arsenite are the more desirable for poison baits, while calcium arsenate is next in value. Our results indicate that lead arsenate should only be used when one of the four poisons mentioned above are not available, and then it must be used at a strength of about 1–20. Our results with arsenous acid are wholly negative.

Table 3. Results from use of varying mixtures.

Combinations tested	Bran, lem. ext. and molasses	Bran, lem. fruit and molasses	Bran and lem. ext.	Bran and lemon fruit	Bran and banana	Bran and molasses	Check
Number experiments....	8	9	3	3	2	3	5
No. larvæ represented.	96	108	36	36	24	36	60
Per cent. killed.....	72.7+	66.6+	72.2+	63.9+	83.3+ without molasses 66.6+ with molasses	72.2+	18.3+

Various experiments were made to determine the effectiveness of bait prepared in different ways. That is, bait where lemon extract was used in place of lemon fruit; and with and without molasses. There was no great difference between baits prepared with bran, lemon extract and molasses; bran, lemon fruit and molasses; bran and lemon extract; bran and lemon fruit; bran and molasses and bran and bananas. However, in all of the experiments where lemon extract was used in comparison with lemon fruit, the extract gave a higher percentage of effectiveness, and these experiments, although carried on in the laboratory, seem to be sufficiently conclusive to warrant the use of lemon extract in

place of fruit if more convenient. There seems to be no noticeable difference in baits where molasses was used and where it was left out, and conversely approximately equal effectiveness was obtained where the fruit or extract was left out of the bait. We had only two experiments using banana in place of the citrus fruits, and the results were very satisfactory and warrant further trials in the field.

Tests of different formulæ to determine the attractiveness of different baits can hardly be considered satisfactory or reliable when conducted in a small pan such as we used, but it is believed that they indicate certain possibilities which should be tested in the field to determine their practical application. This summary is given for the benefit of others who may be planning work along this line the coming season.

"The crude arsenous oxid referred to above contains 85 to 92 per cent. arsenous oxid (As_2O_3), the sample used in our experiment containing 88 per cent., according to the analysis furnished by the U. S. Insecticide Board. It is obtainable from the Anaconda Copper Mining Company, Anaconda, Montana, through the sales agents, The United Metals Selling Co., 42 Broadway, N.Y., at 7½ cents per pound, but only in barrel lots of 400 to 500 pounds."

NOCTUID NOTES.

BY WM. BARNES, M.D. AND J. McDUNNOUGH, PH. D., DECATUR, ILL.

We have read with great interest Mr. Wolley Dod's able criticism of the arrangement of species in our recent Check List (1918, Can. Ent., L, pp. 8–16 and 43–51). We have long regarded Mr. Dod as one of the most careful students of Noctuidæ in America and believe that, in most instances, the shifting of species advocated by him will be found to be correct. In the preparation of our Check List we found it impossible thoroughly to revise each Noctuid genus, as the work involved would have necessitated the postponement of the list for at least several more years; we, therefore, with certain minor limitations, followed the order of species as given in Hampson's Catalogue of the Lepidoptera Phalaenæ of the British Museum, although fairly certain that an intensive study of the structural details of this group and especially of the

male genitalia, would lead to considerable alteration in the sequence of species within the genera (especially such bulky ones as *Polia*, *Hadena*, *Acronycta*, etc.) The only two genera on which we expended more than the usual amount of time and attention were *Euxoa* Hbn. and *Catocala* Schr.; our arrangement of species in this latter genus is vastly different from that given by Hampson and is based upon work done for the American Museum of New York in connection with a forthcoming Memoir on the Catocala moths; in the genus *Euxoa* we had studied rather exhaustively the male genitalia and based the specific synonymy on a comparative study of the genitalia of specimens which we had matched with type specimens in the various museums; very possibly some alteration in the sequence of species may be necessary, but (rightly or wrongly as the case may be) we believe that the synonymy is largely correct.

A few notes on some of the species which Mr. Dod discusses may be of value as giving our standpoint in the matter; we shall only touch on those species concerning which we are inclined to differ from Mr. Dod or about which we are still doubtful.

Arctia obliterata Stretch is not definitely known to us; we based our reference to *ornata* on the strength of the red secondaries and the figure given in Jour. N. Y. Ent. Soc., XIV, Pl. VI, Fig. 14, which looks rather like a specimen of *edwardsi* Stretch with reduced banding on primaries. We had never heard of any tendency in *turbans* to show red secondaries but if, as would appear from Mr. Dod's note, he possesses a specimen with secondaries of this colour his association would probably be more correct than our own.

Euxoa relaxa Sm. Our reference of this species to *septentrionalis* Wlk. is based on a study of the genitalia of the type male from San Francisco in the National Museum. The genitalia of *septentrionalis* are very characteristic and strikingly different from those of *messoria* with which it superficially agrees very closely; the salient features of the genital structure could be seen on the type of *relaxa* without removing the abdomen, and seemed to us to be identical with that of *septentrionalis*.

Euxoa campestris Grt. We are not surprised that Mr. Dod questions the correctness of separating this species from *declarata*

Wlk. (*decolor* Morr.). A study of the genitalia of a number of Eastern specimens convinced us that there were two very closely allied species associated under the one name and occurring apparently throughout the same general territory; the one form has the primaries very dark purple-brown with scarcely any contrasting shades and with small reniform and orbicular; the other form has a more reddish cast to the purple-brown of primaries, the reniform and orbicular are often distinctly larger and the secondaries of the ♂ appear to be paler. The two forms are extremely alike, and we must confess that individual specimens have caused us considerable trouble to place. The differences in the ♂ genitalia are slight but constant, the first form having a shorter inner branch to the harpe, the outer branch being not so evenly rounded at its base and much longer, whilst in the second form the two branches form a very regular U, and the inner is only slightly shorter than the outer. We found considerable difficulty in determining whether names were valid for each of these species. *Declarata* Wlk., the oldest name available, we knew was based on a Vancouver Island male; we had seen the type once but this was before we had realized the existence of two species; from the specimens before us from this region we believed it would apply to the second form and used it in this sense in our list. *Campestris* Grt., another available name, was first described in the October number of the Can. Ent., 1875, VII, 188; a few months later (December) a redescription appeared in the Proc. Acad. Nat. Sci. Phil., p. 423. The specimens from which the description was drawn were from Orillia, Canada, (Norman); N. Y. (Mead); Vancouver Is. (Hy. Edwards), and in the December number of the Can. Ent. for the same year Grote figured the Orillia specimen, a female, (Pl. 1, Fig. 6) designating it (p. 227) as the type. We believe that this action on Grote's part must be taken as definitely fixing the type specimen and that, therefore, the specimen in the British Museum, a ♀ from New York, which bears the type label can at the most be considered a Paratype. Very possibly the Orillia specimen is also in the British Museum as Hampson's catalogue mentions a female from Canada (Norman); if so it should be marked as type; it will be interesting to discover whether the two specimens, the real type and the pseudo-

type, represent the same species or whether Grote's type series was mixed. Judging by his figured type we were led to apply the name *campestris* to the first form mentioned by us, but this will need verification by an actual examination of the specimens, which possibly Mr. Dod can carry out.

Decolor Morr. presents a still more difficult and unsatisfactory problem, since the type specimens cannot be found and are probably destroyed; we placed the species tentatively as a synonym of *declarata* but should not be surprised if it really were found to be a dark form of *tessellata;* the original description (1874, Proc. Bost. Soc. N. Hist., XVII, 162) is poor but mentions a dark, terminal area and dark space between the spots, also a whitish hind-wing with dark border; in Can. Ent. VII, 214, Morrison elaborates on his previous description but his series then probably contained both forms, and his remark about a yellow spot being present at the base of the tegulæ certainly savors of *tessellata*, although the fact that a slight, whitish scaling is often visible in *declarata* makes it impossible to definitely refer *decolor* to *tessellata* on these grounds.

Euxoa orbicularis Sm. The specimens figured by us (Contr. 1, (4), Pl. XVII) as this species does not belong here at all but should be referred to *remota* Sm., a species doubtfully distinct from *tessellata*. The true *orbicularis*, the type of which we have seen in the Tepper collection, is an entirely different species which we have not yet satisfactorily indentified in our material, but which seems best placed somewhere near *mœrens* Grt.

Euxoa remota Sm. We cannot agree with Mr. Dod in referring *tristicula* to this species; it is true that the ♀'s in the Hy. Edwards' collection represent *nesilens* but the ♂ specimen in the National Museum, labeled "type" and to which the name must be held is a form (superficially like *nesilens* we admit) closely allied to some of the *tesselloides* forms and well matched by the specimen we figured as *orbicularis* (Pl. XVII, Fig. 16).

Graptolitha winnipeg Sm. If a specimen before us compared with type and marked "exact" be correct, we cannot agree with Mr. Dod's reference of this species to *laticinerea*. The colour of the primaries in *winnipeg* is a distinctly dark blue-gray without the greenish tinge found in *laticinerea;* a reference of *winnipeg* to *unimoda* would have surprised us less.

LECTOTYPES OF THE SPECIES OF HYMENOPTERA (EXCEPT APOIDEA) DESCRIBED BY ABBÉ PROVANCHER.

BY A. B. GAHAN AND S. A. ROHWER, WASHINGTON, D.C.

(Continued from page 171.)

Semiotellus suborbicularis. Type.—Yellow label 972. 2nd Coll. Pub. Mus., Quebec. Fair.

Sigalphus canadensis. Type.—Female, 2nd Coll. Pub. Mus., Quebec, pinned opposite male with name label and yellow label 594. Both lack head, type has wings crumpled.

Sigalphus trisectus. Type.—Male, blue label 115; yellow label 1302. 2nd Coll. Pub. Mus., Quebec.

Spalangia aenea. Type.—Harrington Coll.

Spathius laflammei. Type.—Female, yellow label 563. 2nd Coll. Pub. Mus., Quebec. Dirty, apices of antennæ gone.

Sphacophilus crawii. Type.—Cat. No. 1979, U. S. Nat. Mus.

Sphaerophthalma alveolata. Type.—Yellow label 1685. 2nd Coll. Pub. Mus., Quebec. Tagged "Cap Rouge."

Sphaerophthalma argentipilis. Type.—Male, white label 17 (in pencil); yellow label 1406. 2nd Coll. Pub. Mus., Quebec.

Sphaerophthalma unicincta. Type.—Yellow label 751. 2nd Coll. Pub. Mus., Quebec.

Sphaeropyx ovalis. Type.—Female, yellow label 1272. 2nd Coll. Pub. Mus., Quebec. Fair. Badly tagged.

Sphaeropyx parvus. Type.—Female, yellow label 1027. 2nd Coll. Pub. Mus., Quebec. Apices of antennæ gone.

Sphaeropyx quebecensis. Type.—Female, yellow label 601. 2nd Coll. Pub. Mus., Quebec. Right antenna and apex of left, gone.

Steniola duplicata. Type.—Male, yellow label 1614. 2nd Coll. Pub. Mus., Quebec. Apex of left antenna gone.

Stilpnus appendiculatus. Type.—Not located.

Stilpnus canadensis. Type.—Male, yellow label 234. 1st Coll. Pub. Mus., Quebec. Antennæ broken at apex; abdomen, right fore-wing and all legs except one front one broken off; abdomen and part of legs glued on yellow label.

Stilpnus deficiens. Type.—Harrington Coll. Antennæ missing and wings dirty.

Stilpnus laevis. Type.—Yellow label 702. 2nd Coll. Pub. Mus., Quebec. Antennæ (right at 7th joint, left at scape), legs on right side at coxæ, left hind leg, right fore-wing and abdomen gone.

Strongylogaster abnormis. Type.—Female, yellow label 1147. 2nd Coll. Pub. Mus., Quebec. Allotype.—Male without label.

Strongylogaster albosectus. Type.—Female, yellow label 96. 1st Coll. Pub. Mus., Quebec. Lacks right flagellum. Two specimens without labels.

Strongylogaster impressatus. Type.—Not located.

Strongylogaster luctuosus. Type.—Female, Harrington Coll.

Strongylogaster pallicoxus. Type.—Female, yellow label 1149. 2nd Coll. Pub. Mus., Quebec. Allotype—Male, Harrington Coll. Paratype.—Female, also Harrington Coll.

Strongylogaster politus. Species must be accredited to Cresson. Type.—Female, Philadelphia No. 274. Male, yellow label 498; 1st Coll. Pub. Mus., Quebec, not a type.

Strongylogaster proximus. Type.—Female, Harrington Coll. Paratype.—Yellow label 1159. 2nd Coll. Pub. Mus., Quebec.

Strongylogaster soriculatus. Type.—Female, yellow label 692; name label "Strongylogaster soriculatipes Prov." in Prov. hand. 2nd Coll. Pub. Mus., Quebec.

Synairema americana. Type.—Female, yellow label 1081. 2nd Coll. Pub. Mus., Quebec. Lacks right flagellum.

Synairema pacifica. Type.—Female, Harrington Coll. Antennæ and right fore-wing gone.

Synaldis pilicornis. Type.—Female, yellow label 1165. 2nd Coll. Pub. Mus., Quebec. Ovipositor broken off.

Syntomaspis splendens. Type.—Harrington Coll. Abdomen missing.

Tapinoma boreale. Type.—Yellow label 1403. 2nd Coll. Pub. Mus., Quebec. Eight specimens on one tag. Badly glued.

Taxonus floridanus. Type.—Cat. No. 13965, U. S. Nat. Mus. Paratype.—Yellow label 1540. 2nd Coll. Pub. Mus., Quebec.

Taxonus parens. Type.—Female, Harrington Coll. Antennæ wanting.

Taxonus robustus Type—Yellow label 931. 2nd Coll. Pub. Mus., Quebec. Flagellum gone.

Telenomus rufoniger. Type.—Yellow label 1364. 2nd Coll. Pub. Mus., Quebec. Fair.

Telenomus stygicus. Type.—White label 20; yellow label 1120. 2nd Coll. Pub. Mus., Quebec Abdomen gone.

Tenthredo atrocoerulea. Type.—Not located. Probably returned to collector. (Geddes).

Tenthredo basilaris. Type—Female, yellow label 58 and name label *Tenthredo signata* Nort. 2nd Coll. Pub. Mus., Quebec. Proved by Prov. Catalogue.

Tenthredo cingulata. Type.—Female, yellow label 59, and name label *Tenthredo verticalis* Say. 2nd Coll. Pub. Mus., Quebec. Proved by Prov. Catalogue.

Tenthredo decorata. Type.—Not located.

Tenthredo erythromea. Type.—Harrington Coll. Female. Paratype.—Yellow label 1154. 2nd Coll. Pub. Mus., Quebec.

Tenthredo jocosa. Type.—Female, yellow label 494. 2nd Coll. Pub. Mus., Quebec.

Tenthredo lineata. Type.—Female, yellow label 63. 2nd Coll. Pub. Mus., Quebec. Lacks part of flagellum.

Tenthredo mellicoxa. Type.—Female, yellow label 109; white label "109 mellicoxa." 1st Coll. Pub. Mus., Quebec.

Tenthredo montana. Type.—Not located. Probably returned to collector. (Capt. Geddes.)

Tenthredo nigricostata. Type.—Female, Harrington Coll. Lacks antennæ.

Tenthredo pallicoxa. Type.—Female, yellow label 69. 2nd Coll. Pub. Mus., Quebec. Rather dirty.

Tenthredo ruficoxa Type. — Female, Harrington Coll. Right median tarsi gone, slightly dirty.

Tenthredo terminalis. Type.—Male, Harrington Coll. Left flagellum gone.

Tetrastichus trisulcatus. Type.—Harrington Coll. Fair. Allotype.—Yellow label 1377. 2nd Coll. Pub. Mus., Quebec. Badly glued.

Thalessa quebecensis. Type.—Not located.

Theocolax canadensis. Type.—Yellow label 1030. 2nd Coll. Pub. Mus., Quebec. Badly glued.

Thersilochus errabundus. Type.—Harrington Coll.

Thersilochus maturus. Type.—Female, yellow label 1227, blue label 106 (s). 2nd Coll. Pub. Mus., Quebec.

Thersilochus micans. Type.—Female, yellow label 372. 1st Coll. Pub. Mus., Quebec. Allotype.—Male, yellow label 1040. 2nd Coll. Pub. Mus., Quebec. Right antenna at scape missing, abdomen broken off at petiole but glued on yellow label.

Thersilochus pallipes. Type.—Female, yellow label 676. 2nd Coll. Pub. Mus., Quebec. Antennæ broken at tips.

Thyreocera læviscutum. Type.—Yellow label 1322. 2nd Coll. Pub. Mus., Quebec. Badly glued.

Thyreopus elongatus. Type.—Not located.

Thyreopus rugosopunctatus. Type.—Female, blue-green label 851(s); yellow label 1445. 2nd Coll. Pub. Mus., Quebec.

Thyreopus sinuatus. Type.—Not located. Probably returned to collector.

Tiphia minor. Type.—Not located.

Trichacius clavatus. Type.—Blue label 764; yellow label 1376. 2nd Coll. Pub. Mus., Quebec. Fair.

Trichacis auripes. Type.—Not located.

Trichiosoma taylori. Type.—Female. Lacks left antenna. Allotype—male. Ent. Branch, Dept. Agr., Ottawa. Male paratype.—Yellow label 1151. 2nd Coll. Pub. Mus., Quebec.

Trogus canadensis. Type.—Female, yellow label 241. 1st Coll. Pub. Mus., Quebec. Allotype.—Male, yellow label 194. 2nd Coll. Pub. Mus., Quebec.

Trogus quebecensis. Type.—Female, yellow label 240. 1st Coll. Pub. Mus., Quebec. Right antenna gone.

Tropistes elegans. Type.—Not in Pub. Mus., Quebec, unless under *Arotes amoenus* Cress.

Tryphon canaliculatus. Type.—Female, yellow label 325. 2nd Coll. Pub. Mus., Quebec. Fair.

Tryphon clapini. Type.—Female, yellow label 421. 1st Coll. Pub. Mus., Quebec.

Tryphon clypeatus. Type.—Male, yellow label 333. 2nd Coll. Pub. Mus., Quebec.

Tryphon dionnei. Type.—Female, yellow label 657. 2nd Coll. Pub. Mus., Quebec. Lacks left flagellum.

Tryphon dorsalis. Type.—Female, yellow label 363. 2nd Coll. Pub. Mus., Quebec.

Tryphon dufresnei. Type.—Female, not located. Allotype.—Male, yellow label 329. 2nd Coll. Pub. Mus., Quebec.

Tryphon excavatus. Type.—Female, yellow label 1560. 2nd Coll. Pub. Mus., Quebec. Lacks apex of right antenna.

Tryphon fractus. Type.—Male, blue label 560. 2nd Coll. Pub. Mus., Quebec.

Tryphon hervieuxii. Type.—Female, yellow label 656. 2nd Coll. Pub. Mus., Quebec. Head gone.

Tryphon pediculatus. Type.—Male, yellow label 1236. 2nd Coll. Pub. Mus., Quebec.

Tryphon rufigaster. Type.—Female, yellow label 1562. 2nd Coll. Pub. Mus., Quebec.

Tryphon rufopectus. Type.—Male, yellow label 1563. 2nd Coll. Pub. Mus., Quebec. Poor condition, apices of flagellum gone.

Tryphon scutellaris. Type.—Not in Pub. Mus., Quebec, unless as var. of *dufresnei* Prov.

Tryphon tuberculifer. Type.—Female, yellow label 1237; labeled "Tryphon tuberculiferus Prov." 2nd Coll. Pub. Mus., Quebec.

Trypoxylon striatum. Type.—Not located. Probably returned to collector.

Urocerus tricolor. Type.—Female, yellow label 72. 2nd Coll. Pub. Mus., Quebec.

Westwoodia fumipennis. Type.—Female, yellow label 388. 1st Coll. Pub. Mus., Quebec.

Xiphidion canadensis. Type.—Female, yellow label 138. 1st Coll. Pub. Mus., Quebec.

Xiphydria canadensis. Type.—Female, yellow label 137. 1st Coll. Pub. Mus., Quebec. Apices of left wings wanting.

Xorides canadensis. Type.—Not in Pub. Mus., Quebec, unless under *Xylonomus albopictus* Cress.

Xylonomus calidus. Type.—Female, blue label 596, in large figures. 2nd Coll. Pub. Mus., Quebec.

Xylonomus lavallensis. Type.—Not in Pub. Mus., Quebec, unless under *Xylonomus humeralis* Say.

Zele basalis. Type.—Female, white label 81; yellow label 1483. 2nd Coll. Pub. Mus., Quebec. Badly tagged.

Zele cinctus. Type.—Male, yellow label 729. 2nd Coll. Pub. Mus., Quebec. Abdomen, left legs, left fore-wing and part of antennæ gone.

Zele curtus. Type.—Female, blue label 277(s); yellow label 1276. 2nd Coll. Pub. Mus., Quebec. Wings somewhat matted.

Zele gracilis. Type.—Male, yellow label 1277. 2nd Coll. Pub. Mus., Quebec. Badly tag-mounted.

Zele palliventris. Type.—Female, yellow label 573. 2nd Coll. Pub. Mus., Quebec. Lacks left flagellum and all legs except left front leg; abdomen glued on card.

Zele rufipes. Type.—Female, yellow label 731. 2nd Coll. Pub. Mus., Quebec.

THE EARLY STAGES OF EMPOASCA TRIFASCIATA GILL.[1]

BY HARRY B. WEISS AND EDGAR L. DICKERSON,*
NEW BRUNSWICK, N. J.

While not recorded in Smith's List of the Insects of New Jersey, this attractive little leaf-hopper appears to be fairly well distributed in New Jersey, having been found by the writers on poplar at Irvington, Red Bank, Ridgefield, Trenton and New Brunswick. De Long in his "Leafhoppers or Jassoidea of Tennessee" (Bull. 17, Vol. V, No. 2, Tenn. State Bd. Ent.) records it as being swept from cottonwood at Clarksville, Tenn., and Van Duzee in his check list of the "Hemiptera of America, North of Mexico," gives its distribution roughly as "Eastern States to the Mississippi Valley and Eastern Canada." It was described by Gillette in the Proc. U. S. Nat. Mus., vol. XX, p. 726 (1898) from specimens taken at Douglas Co., Kansas, Champaign, Ill.,

[1]Identified by E. P. Van Duzee.

*The arrangement of the authors' names has no significance, and indicates neither seniority nor precedence.

and Ames, Iowa, having been found on cottonwood at the latter locality.

In New Jersey it has been found on both Carolina poplar (*Populus deltoides*) and Lombardy Poplar (*Populus nigra italica*) principally on the former. Over-wintering takes place in the egg stage, the eggs being found in young twigs and hatching occurs

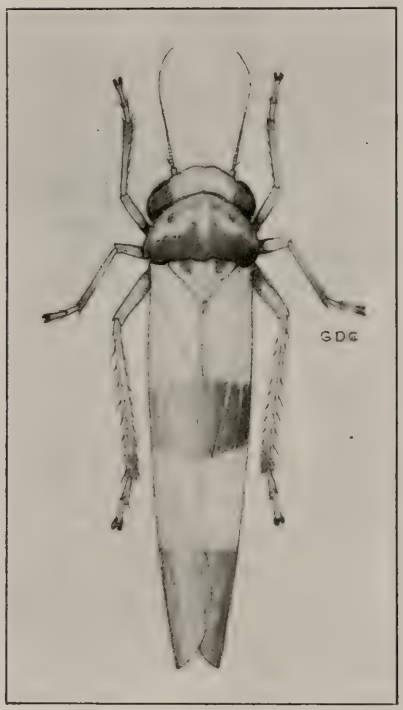


Fig. 8.—*Empoasca trifasciata* Gill.

during the last of May or first part of June. From three to four weeks are required for the nymphal stages, and by the last of June or first of July, adults of the first brood are present. Summer eggs are then deposited in the tissue of young twigs, and these hatch during the last week of July. By the last of August, adults of a second brood are present. Winter eggs are deposited during

September, and the adults linger on the trees until the cool weather of early October.

Both the nymphs and adults are very active. After hatching, the nymphs make their way to the leaves and can be found on both surfaces, principally the lower. They appear to scatter considerably after the early stages. In one instance only, early in the season, a colony of nymphs was found, but during the remainder of the season, all stages of the nymphs were found singly on the leaves and scattered over the trees. When many nymphs are present, their feeding produces a characteristic, whitish discolouration of the upper leaf surface.

The adults are extremely active and scatter soon after emergence. On rainy days they exhibit a tendency to collect to a certain extent on the foliage, and at these times many can be obtained without difficulty.

Egg.—Length 0.92 mm., width 0.15 mm. Translucent, cylindrical, elongate, sides parallel; basal end rounded; neck bent slightly to one side; slightly curved when viewed laterally. The eggs appear to be laid singly in the last made growth of the twig. The position of each egg is indicated by a blister-like elevation of the bark about one-sixteenth of an inch in diameter. These blisters may be either circular or oval. Each egg is firmly embedded in the tissue under the bark with its long axis parallel to the twig and with its cap facing the bark. Upon removing the blister-like elevation of the bark, only a slight discolouration of the green tissue indicates the presence of an egg. On account of their translucence, they blend with the tissue and are easily overlooked unless a careful search is made. The blisters are found anywhere on the young twigs, sometimes in groups of two or three, but more often widely removed from each other.

First stage nymph.—Length 1.25 mm., width of head including eyes 0.26 mm. Shape elongate, broadest at head and fore part of abdomen, tapering posteriorly. Dorsal surface reddish brown. Fine median white line on front of head and dorsal surface of head and thorax. First and second abdominal segments white. Dorsal surface of head, each thoracic and abdominal segment bearing transverse rows of hairs; several hairs on head and a transverse row on posterior margin of each thoracic and abdo-

minal segment. Eyes prominent. Antennæ reddish brown, about one-half the length of the body. Legs reddish brown except coxa, trochanter, basal portion of femur, apical end of tibia and base of tarsus which are light. Femur and tibia bearing hairs. Rostrum extending to second pair of legs.

Second stage nymph.—Length 1.72 mm., width of head including eyes 0.46 mm. Similar to first stage but slightly darker. Median line indicated on dorsal surface.

Third stage nymph.—Length 2.1 mm., width of head including eyes 0.5 mm. Similar to preceding stage but slightly darker. Dorsal surface of thorax depressed. Sides of mesothorax extending half way through metathorax. Metathorax extending slightly at sides. Antennæ two-fifths the length of the body.

Fourth stage nymph.—Length 2.8 mm., width of head including eyes 0.7 mm. Similar to third stage but darker. Light median dorsal line indicated on abdomen in some specimens. Wing-pads of equal length, decidedly more pronounced, narrow, extending to the third abdominal segment.

Fifth stage nymph.—Length 3.5 mm., width of head including eyes 0.75 mm. Dorsal surface dark, reddish brown. Fine median line on front and dorsal surface of head and thorax. A light patch on each side of line on head. Median posterior portion of mesothorax white. Surface of metathorax white, tinged with brown. Wing-pads of equal length, long, narrow, reaching fourth abdominal segment. Fine, median, dorsal line indicated on abdomen. Eyes prominent. Antennæ reddish brown, basal joints darker, one-third length of body. Legs, light reddish brown, lighter at base of femur and tip of tibia. Coxa and trochanter white. Rostrum white, reaching to between second pair of legs.

Adult.—Empoasca trifasciata Gillette. The description of this species by Gillette in "American Leaf-hoppers of the Subfamily Typhlocybinæ" (Proc. U. S. Nat. Mus., vol. XX, p. 726) follows: "Pale green, with three transverse, smoky bands above. Length 4 mm. Face golden yellow above, shading into green on the clypeus, with a broad, whitish, median stripe; face fully as long as broad. Front with sides nearly parallel, two-thirds longer than broad between the eyes, very obtusely rounded above. Clypeus about one-third longer than broad, a little less than one-

half the length of the front, broad at the base, constricted at the upper one-third, rather blunt at the apex. Genæ appearing as a mere line past the loræ but nearly attaining the tip of the clypeus; genæ, loræ and clypeus pale green. Vertex slightly longer at the middle than at the eyes, very obtusely rounded in front, colour golden yellow, paler on posterior margin, having a slender, dark median line, ocelli pits large and pale in colour, but no ocelli; eyes very black and large, shortest distance between the eyes 1.7 times the length of the vertex at the middle. Pronotum twice the length of the vertex and nearly twice as wide as long; anterior two-thirds golden yellow, the remainder black. Scutellum bright green at tip but somewhat smoky on posterior portion. Elytra pale green, a deep smoky transverse band at the middle of the clavus, not quite attaining the costal margin, the apical area deep smoky on inner half, second apical cell with a short peduncle. Tergum washed with golden yellow, venter pale green, tips of pygofers and ovipositor deep green. Legs pale green with tips of tibiæ and tarsi deep blue green."

AN ANNOTATED LIST OF THE CERAMBYCIDÆ OF CALIFORNIA.

BY RICHARD T. GARNETT, UNIVERSITY OF CALIFORNIA, BERKELEY, CAL

(Continued from page 177.)

53. *Aneflus volitans* LeConte.
    Found at San José del Cabo, Lower California.
54. *Aneflus prolixus* LeConte.
    Found at Cape San Lucas, Lower California.
55. *Aneflus protensus* LeConte.
    Found at Cape San Lucas, Lower California.
56. *Aneflus linearis* LeConte.
    Found at Cape San Lucas, Lower California.
57. *Eustroma validum* LeConte.
    Found in Southeastern California and at San José del Cabo, Lower California.
58. *Compsa puncticollis* LeConte.
    Found at San José del Cabo, Lower California.
59. *Compsa quadriplagiata* LeConte.
    Found at Cape San Lucas, Lower California.

60. *Poecilobrium chalybæum* LeConte.
Found in the middle part of California, common on flowers of Ceanothus at Pasadena; also on poison oak flowers in Sonoma Co. June 3–July 7.

61. *Poecilobrium rugosipenne* Linnell.
One specimen taken from California.

62. *Eumichthus oedipus* LeConte.
Found in Humboldt and Sonoma Counties on flowers of Spiraea.

63. *Phyton discoideum* LeConte.
Found at Cape San Lucas, Lower California.

64. *Hybodera tuberculata* LeConte.
A number of specimens have been taken by Ricksecker at Camp Meeker, Sonoma County. Breeds on maple in Washington.

65. *Hybodera debilis* LeConte.
Found in Los Angeles County by Fall. Has been beaten from live oak in the Bay Counties by Van Dyke.

66. *Callimus cyanipennis* LeConte.
Found occasionally in Northern California and Sierras. Taken frequently in Southern California, at Los Angeles on Ceanothus by Fall. Found on Ceanothus, Spiraea, and other flowers by Van Dyke.

67. *Callimus ruficollis* LeConte.
Found commonly in Northern California on Ceanothus and poison oak flowers by Van Dyke. I found this so numerous in June in Lake County as to be present in almost every sweeping of poison oak; so numerous that most were allowed to escape. June 7–July 9.

68. *Megobrium edwardsii* LeConte.
This has been found on live oak at Pomona by Fall, on oak at San Diego by Blaisdell, taken from Ceanothus twigs at Monterey by Slevin, and also found at Santa Rosa Island.

69. *Callimoxys sanguinicollis* Olivier (*C. fuscipennis* Lec.—male).
Found rarely in Southern California, common in Northern California on flowers of Ceanothus and poison oak. June 1–July 3.

70. *Molorchus longicollis* LeConte.
Found rarely in Southern California, common in Northern California on Ceanothus and various other flowers. June 13.

71. *Rhopalophora bicincta* Horn.
Found in Lower California.

72. *Rhopalophora rugicollis* LeConte.
Found in Lower California.

73. *Holopleura helena* LeConte. (*H. marginata* Lec.—female).
Found in Northern California and Sierras, rare in Southern California. Bred by the author from laurel at Oakland, Alameda Co. June 28–July 3.

74. *Rosalia funebris* Motschulsky.
This is common in the redwood belts of Marin and Sonoma Counties. Breeds in laurel (*Umbellularia californica*). In State of Washington it breeds in ash. Taken at Oakland, June 21.

75. *Dendrobias mandibularis* Serv. (*quadrimaculatus* Dup.)
Has been found commonly by Fall on the wing in early evening, about the willows along the Colorado River at Yuma in July. Found in Lower California. July 5.

76. *Lissonothus multifasciatus* Dup.
Found in Arizona; supposed also to be in vicinity of Yuma. Found in Lower California.

77. *Stenaspis solitaria* Serv.
Common at Cape San Lucas, Lower California.

78. *Tragidion annulatum* LeConte.
Found by Fall at Pomona, Pasadena, Lower California; by Van Dyke at Banning on mesquite; by Cottle at Upper Soda Springs, Shasta Co.; also by Van Dyke on South Fork of the King's River Canyon, Fresno.

79. *Tragidion armatum* LeConte.
Found by Van Dyke at Newhall, Los Angeles Co., sucking the sap of *Yucca whipplei*.

80. *Purpuricenus dimidiatus* LeConte.
Taken by Blaisdell at San Diego, by Van Dyke in Shasta Co., by Huguenon at Alma, Santa Cruz Co.

Found on Yerba Santa, locally called "Mountain Balm." July 12.

81. *Metaleptus angulatus* Chevrolat.
Found in desert region of Southern California.

82. *Amannus pectoralis* LeConte.
Location given as Yuma by LeConte.

83. *Batyle suturalis* Say.
Taken in numbers by author in latter part of May at Calistoga, Napa County. On Ceanothus flowers. May 28–June 27.

84. *Oxoplus marginatus* LeConte.
This and the following may be sexes. Found at San José del Cabo, Lower California.

85. *Oxoplus cruentus* LeConte.
Found at San José del Cabo, Lower California.

86. *Oxoplus jocosus* Horn.
Rare in the foothills near Pomona; found by Fall flying in day-time along the streams.

87. *Crossidius ater* LeConte.
Found in Nevada. Probably is also found in adjacent parts of California.

88. *Crossidius testaceus* LeConte.
Found at San Diego by Ricksecker, flying in September. Breeds on the roots of *Bigelovia arborescens.*

89. *Crossidius intermedius* Ulke.
Found in Los Angeles County on small, yellow-flowered plants.

90. *Crossidius discoideus* Say.
Taken by Coquillett in Mountains of Los Angeles County.

91. *Perarthrus vittatus* LeConte.
Found by Ricksecker at San Diego in September on the flowers of *Bigelovia arborescens.*

92. *Sphœnothecus suturalis* LeConte.
No data on this species.

93. *Sphœnothecus basalis* Horn.
Found at San José del Cabo, Lower California.

94. *Stenosphenus novatus* Olivier.
Found at San José del Cabo, Lower California. Several specimens were beaten from willow in July at Yuma by Fall.

95. *Cyllene antennatus* White.
Common in the deserts of Southern California, breeding in mesquite. Has been picked up on the streets of Los Angeles. Also bred by Van Dyke from mesquite brought to Los Angeles as fire wood.

96. *Cyllene crinicornis* Chevrolat.
Found in the deserts of Southern California. Have a specimen sent to me from Hololulu, T. H.

97. *Clytus lanifer* LeConte.
Found throughout the State, especially north of San Francisco and in the Sierras. Taken by Van Dyke on the flowers of *Eriogonum fasciculatum*. Abundant on the flowers of the chestnut oak in Sonoma Co. Also taken in the San Bernardino Mts. by Van Dyke. Taken by myself at Newcastle in July.

98. *Clytus planifrons* LeConte. [*Xylotrechus* in Henshaw–6189].
Found rarely north of San Francisco and in the Sierras. Bred by Rivers from dead branches of willow at San Francisco.

99. *Xylotrechus undulatus* Say.
Found in northern part of the State and in the Sierras. Breeds in *Pseudotsuga taxifolia* and probably other coniferous trees. Taken at St. Helena, Napa Co., by the author from cordwood of *Pinus ponderosa*. June 1–July 30.

100. *Xylotrechus insignis* Lec.—female. (*X. obliteratus* Lec.—male).
Breeds in various species of willow; found in all parts of State. There are two forms, one of them a southern form with much yellow pubescence.

101. *Xylotrechus annosus* Say.
Rare in northern part of State. Taken by author at Donner Lake in July. Taken by Van Dyke in Trinity County breeding in poplar.

102. *Xylotrechus nauticus* Mannerheim.
Found commonly throughout the State. Taken by Blaisdell and Van Dyke breeding in live oak; taken by Blaisdell and Pierson breeding in *Eucalyptus globulus* at San Diego and Berkeley, respectively. Also taken in Sonoma County by Ricksecker. June 2–Aug. 14.

103. *Neoclytus irroratus* LeConte.
Rare, but several have been found in Southern California. Taken at Pasadena by Dagget, at Santa Barbara by Fall, at Los Angeles, Mt. Shasta, and the south fork of the King's River Canyon by Van Dyke.

104. *Neoclytus conjunctus* LeConte.
Found in Northern California. Taken by Van Dyke breeding in manzanita and madrone; found by Kusche breeding in *Quercus douglasi* and *Fraxinus oregona.*

105. *Neoclytus muricatulus* Kirby.
Feeds on *Pseudotsuga taxifolia* in the northern part of the State.

106. *Neoclytus balteatus* LeConte.
Rare, 2 taken in Shasta County, one by Cottlé, one by Van Dyke; taken on manzanita. One taken by Van Dyke near the King's River, Fresno County, and one by Slevin near Monterey.

107. *Neoclytus interruptus* LeConte.
Found in Northern California. July 26.

108. *Neoclytus modestus* Fall.
Taken by Fall and Hopping at Pasadena and Kaweah, respectively.

109. *Neoclytus carus* Fall.
Found in the mountains near Pasadena by Fall, and at Santa Monica by Van Dyke.

110. *Neoclytus tenuiscriptus* Fall.
Taken by Fall at Pasadena and Claremont.

111. *Euderces parallelus* LeConte.
Found at San José del Cabo, Lower California.

112. *Callichroma cobaltinum* LeConte.
Found at Cape San Lucas, Lower California.

113. *Atimia confusa* Say.
This has been cited from California by Henshaw, but this is doubtful. (Teste Van Dyke).

114. *Atimia dorsalis* Le Conte.
Found mainly in the north and in the middle Sierras. Is found rarely at Riverside. Taken by Van Dyke breeding in post cedar.

115. *Desmocerus auripennis* Chevrolat.
Found from Mt. Shasta to Mt. Whitney in the high Sierras, breeding in mountain elderberry. Taken at Truckee in July by myself. July 7.

116. *Desmocerus cribripennis* Horn.
Found mainly in Coast Belt not more than several miles from the sea, as far south as Mt. Tamalpias. Breeds in red-berried elderberry trees. (Van Dyke).

117. *Desmocerus californicus* Horn.
Rare, found from Los Angeles north through the coast range to Marin County. Breeds in black-berried elderberry trees. (Van Dyke).

118. *Necydalis laevicollis* LeConte.
Found in Northern California. Bred from tan bark oak by H. C. Muzzall.

119. *Necydalis cavipennis* LeConte.
Found in Santa Cruz County, also on Russian River. Taken by Van Dyke in the North, and by Ricksecker in San Diego and Sonoma Counties.

120. *Necydalis barbaræ* Rivers.
Found rarely at Santa Barbara.

121. *Ulochætes leoninus* LeConte.
Found in Northern California and Sierras, also San Bernardino Mts. Bred from *P. ponderosa* by Van Dyke at Sissons and King's River.

122. *Pyrotrichus vitticollis* LeConte.
Found by Fuchs and Van Dyke breeding in the heartwood of alders about San Francisco Bay. May 29.

123. *Leptalia macilenta* Mannerheim.
Breeds in willow, found along the coast belt from

northern boundary to Santa Cruz. Taken at Oakland, November 2.

124. *Rhagium lineatum* Olivier.
Breeds in various pines. Found by Blaisdell breeding in yellow pine; by author on Jeffrey pine at Summit, Nevada County; by Slevin on Monterey pine at Monterey. Found north and throughout the Sierras. June 18–July 29.

125. *Centrodera nevadica* LeConte.
Taken by Fuchs near Lake Tahoe; by Blaisdell at San Diego; by Pilate in Tulare County; by Van Dyke in Trinity County, breeding in *Pinus ponderosa*.

126. *Toxotus vestitus* Hald.
Common in Northern California and throughout the Sierras. Found on flowers of wild hollyhock, azalea, lupine, etc. There are several colour varieties. Taken at Oakland, June 2.
var. *nubifer* LeConte.
var. *lateralis* Casey.
Taken at San Francisco.

127. *Toxotus flavolineatus* LeConte.
This is the western phase of *T. vittiger* Rand (=*T. trivittatus* Say). Found in the deep woods of the coast belt just north of San Francisco.

128. *Pachyta monticola* Rand.
Rare in the Sierras and north, probably feeds on spruce.

129. *Pachyta liturata* Kirby.
Found at high altitudes in the Sierras. Taken by Daggett on Mt. Whitney at elevation of 8,000–9,000 feet. Taken by Van Dyke at Mt. Shasta at elevation of 8,000 feet, breeding in fir.

130. *Pachyta spurca* LeConte.
Several specimens taken by Fall at Echo Mt., Southern California. Found by Van Dyke at Santa Monica. Breeds in *Pseudotsuga taxifolia*. It flys at night and is attracted to light. Is more common in the Sierras and north of San Francisco. July 13.

131. *Anthophilax tenebrosus* LeConte.
Rare in the Sierras, several specimens having been taken in Placer and Eldorado Counties. July 13.

132. *Acmæops pinguis* LeConte.
This is probably a variety of *A. tumida* LeConte.

133. *Acmæops tumida* LeConte.
Rare in Southern California; common in Central and Northern California on flowers, especially *Ranunculus californicus*, wild sunflower, wild hollyhock, etc. Taken by author at Oakland and Calistoga. June 1–November 7.

134. *Acmæops viola* LeConte.
Found in the extreme northern part of the State on flowers. Also taken at Calistoga by author. May 28.

135. *Acmæops vincta* LeConte.
Described from Montana, also taken in Oregon. Probably found in the extreme north of California.

136. *Acmæops basalis* LeConte.
Common in the middle of California and occasionally in the north on wild rose and certain umbelliferous plants. June 20.

137. *Acmæops militaris* LeConte.
Fairly common in parts of the extreme north of the State and in the Sierras. Taken in Sonoma County by Ricksecker. June 11–July 21.

138 *Acmæops falsa* LeConte.
Found by Daggett at Mt. Whitney, between the leaves of *Yucca whipplei*. Taken by Van Dyke in June on flowers, especially those of wild holly. Found also at Calmalli Mines, Lower California.

139. *Acmæops proteus* Kirby
Taken by author at Calistoga, June 1. Reported from Lower California.

140. *Acmæops pratensis* Laich.
Rare in Northern California and occasionally in the higher Sierras as far south as Mt. Whitney. More common in the North and in the Rockies.

(To be continued)

ON THE VALIDITY OF *EUPITHECIA HARLEQUINARIA* DYAR.

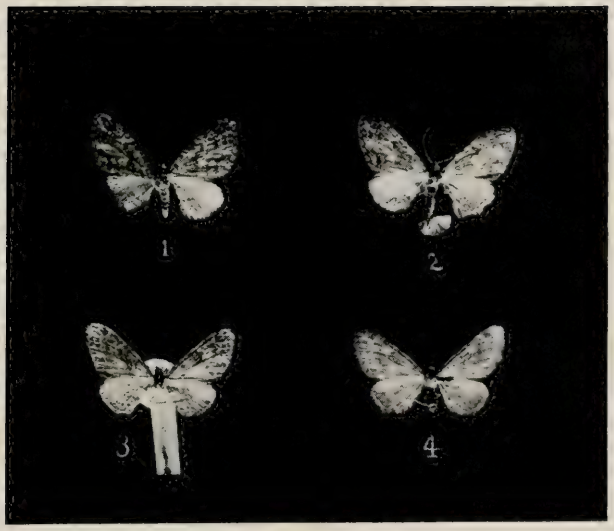
BY E. H. BLACKMORE, VICTORIA, B.C.

In the Check List of B. C. Lepidoptera, published by the Provincial Department of Agriculture in 1916, the late Rev. G. W. Taylor listed *Eupithecia harlequinaria* Dyar as a synonym of *bifasciata* Dyar. Later, in the Can. Ent., Vol. XVII, No. 3, p. 80, he says of *harlequinaria* that "one of the Victoria specimens passed through my hands and I have no hesitation in saying that it was merely a very brightly coloured, fresh specimen of *bifasciata*."

As I have been making a special study of the B. C. Geometrids for the past four years, I was naturally interested in the above remark. In 1914 I took a worn specimen of *Eupithecia* which was referable to *harlequinaria* as compared by me with one of the types which is in the Provincial Museum, Victoria, B.C.

In 1915 I took another specimen, which was in perfect condition and matches the type exactly. Through the kindness of Mr. J. W. Cockle, of Kaslo, who sent me three specimens of *bifasciata* I have been able to make a careful comparison of them, and I have no hesitation in saying that they are two distinct, and easily recognizable species, and that they are not liable to be confused one with the other. One of Mr. Cockle's specimens bears a label in his handwriting: "One of the original set from which Dyar's determination was made" and I presume that Mr. Cockle means that it is one of the short series that he had, from which Dr. Dyar selected the one which he made the type. However, it exactly fits Dr. Dyar's description of *bifasciata* (Proc. U. S. Nat. Mus., Vol. XXVII, p. 891). Dr. Dyar's description of *harlequinaria* (Proc. Ent. Soc., Wash., vol. 7, p. 29, 1905) is particularly good, and the specimen I took in 1915 fits the description in every particular.

Anyone reading the two descriptions together could not, by any stretch of the imagination, believe them to refer to the same species, and it is inconceivable to me that Dr. Dyar would describe the same insect twice in such a short space of time. The most striking difference between the two species is the presence, in *harlequinaria* of a large, bright, ochreous patch on the upper side of the primaries, running from the discal spot to fringe, and occupying the space between veins 3 and 4, overspreading each a



EXPLANATION OF PLATE III.

Fig. 1.—*Eupithecia harlequinaria* Dyar. Type specimen in Provincial Museum, Victoria, B.C. Taken by E. M. Anderson, May 20, 1903.

Fig. 2.—*Eupithecia harlequinaria* Dyar. Agrees with type, but is a perfect specimen. Taken at Victoria, B.C., by E. H. Blackmore, May 2, 1915.

Fig. 3.—*Eupithecia bifasciata* Dyar. One of the short series from which Dyar selected his type. Taken at Kaslo, B.C., by J. W. Cockle, June 7, 1903.

Fig. 4.—*Eupithecia bifasciata* Dyar. Agrees with Fig. 3. Taken at Kaslo, B.C., by J. W. Cockle, June 17, 1907.

little. It is an irregular oval patch, measuring approximately 5 mm. in breadth by 2 mm. in depth. This at once distinguishes it from any other *Eupithecia* known to me.

The broad, whitish band at the outer third, which is a distinguishing feature of *bifasciata* is not present in *harlequinaria*. Apart from the difference in maculation, they also differ in time of emergence. My two specimens of *harlequinaria* were taken May 2nd, 1915, and May 22nd, 1914, (worn), respectively, and the type in the Provincial Museum bears a label in Dr. Dyar's handwriting: "20th May, 1903." The three specimens of *bifasciata* from Mr. Cockle bear dates June 7th, 1903; June 17th, 1907; and July 3rd, 1910, and Dr. Dyar's types were June 13th and 25th, so that it is quite evident that there is a full month's difference in the time of their appearance.

Further I have no record of *bifasciata* being found west of the Cascade Range, and all the specimens of *harlequinaria* that I know of, have been taken on the immediate coast. As regards the latter species it must be exceedingly rare, as I can find no record of any specimens being taken at Victoria between those taken by Mr. E. M. Anderson in 1903, and the two that I captured in 1914 and 1915. I have seen all the chief collections in Vancouver and on Vancouver Island, but none of them contain any specimens of *harlequinaria*.

In conclusion I think that I have adduced enough evidence to prove conclusively that *harlequinaria* and *bifasciata* are two distinct species.

Author's Note.—This article was written eighteen months ago, but was accidentally mislaid and only recently found. I wrote to Messrs. Barnes and McDunnough, pointing out these differences about a year ago, and they have listed them as distinct species in their new Check List.

BOOK NOTICE.

Field Book of Insects—By Frank E. Lutz, Ph. D., Associate Curator, Dept. of Invertebrate Zoology, American Museum of Natural History. Pp. 509. About 800 illustrations, many in colour. G. P. Putnam's Sons, New York and London, 1918. $2.50.

This is a companion to the Field Book of Wild Birds and their Music, Field Book of American Wild Flowers and Field Book of American Trees and Shrubs, and its aim is to give the kind of

information about insects usually sought by the laity, with whom the author, in connection with his museum work, has long been in close contact. Its usefulness, however, does not stop here, for it will prove invaluable to every young entomologist and serviceable even to those of experience. It contains a great deal of information within a small compass, and although necessarily much condensed it is written in simple language as free as possible from technical terms.

The first 38 pages contain brief sections of an introductory nature on the system, growth and structure of insects, longer discussions on collecting and mounting, and on the control of injurious forms, and on insect-like Arthropods, particularly spiders. The rest of the book treats of the various orders and families, with brief accounts of the commoner or more striking species found in the Northeastern United States. Particular attention is given to such forms are are commonly observed by the layman, such as the larger, more conspicuous or more injurious species, but some notice is taken of nearly all the families. Thus we find that a relatively large space is given, and quite properly so, to the butterflies and larger moths and to some of the beetles. The long-horned beetles, however, receive somewhat more than their share of space, there being a key to the species extending over nearly twenty pages. There are a number of other keys to families and genera and in some cases species, and among the latter is a useful one to the commoner kinds of Muscid flies, which is followed by brief descriptions of the characters and habits of the more important species and of the methods of combatting these dangerous insects. There is also a special section at the end of the book on galls, which is illustrated by a large number of figures.

The illustrations form a most attractive feature of the book. Almost 700 of the entire number are the work of Mrs. E. L. Beutenmuller, who deserves great credit for the faithful manner in which she has performed an enormous task. Some of the coloured plates have suffered in the reproduction but most of them are satisfactory and the black-and-white figures are almost uniformly excellent. Nearly 600 species are illustrated by one or more figures.

We heartily recommend this admirable work to every young entomologist and outdoor naturalist.

Mailed June 5th, 1918.

The Canadian Entomologist.

Vol. L. LONDON, JULY, 1918 No. 7

POPULAR AND PRACTICAL ENTOMOLOGY.

Popilia japonica Newm., a Recently Introduced Japanese Pest.

BY EDGAR L. DICKERSON AND HARRY B. WEISS, NEW BRUNSWICK, N.J.

While inspecting a nursery in Southern New Jersey during the middle of August, 1916, the attention of the writers was attracted by a scarabæid feeding on the tips of Cratægus. Specimens were collected, and inasmuch as it was assumed to be a southern species, no particular attention was paid to it at that time. Recognizing, however, that it was new to New Jersey, specimens were recently sent to Mr. H. S. Barber and identified by him as *Popilia japonica* Newm. Mr. Barber stated that our specimens seemed to agree satisfactorily, even in the female genitalia, with the series of Japanese specimens in the collection of the United States National Museum. He also stated that this was the first record of the genus from America, and further that species in allied genera have caused considerable trouble in the Old World and when introduced into various of the Pacific Islands.

On July 31, soon after receiving this information, the nursery was visited and the beetles found to be present. They were especially abundant on weeds in one corner of the nursery, and to a lesser extent on adjoining nursery stock. On August 8, 1917, the nursery was again visited for the purpose of determining the exact status of the insect. At this time a considerable area was scouted and the following conditions observed. The beetles were found to be extremely abundant on weeds growing along one side of the nursery and extending at one point for a few feet into an adjoining orchard and along one side of the orchard away from the nursery and for a couple of hundred yards beyond. The infested area was small but the beetles numerous, and the line of spread appeared to have followed the weeds. At several places the insects were found on nursery stock, in most cases not far from the heavily infested weeds.

The feeding appears to be somewhat like that of the rose chafer and other scarabæids, but the destruction of the foliage is much more complete. Smartweed (*Polygonum virginianum*), tearthumb (*Tiniaria arifolium*) both belonging to the *Polygonaceæ*, evening primrose (*Oenothera biennis*), Virginia creeper (*Ampelopsis quinquefolia*), a member of the Vitaceæ, were the principal food plants among the weeds, and in some cases the leaves of these plants were completely riddled. Other weeds infested to a less extent were ragweed (*Ambrosia* sp.), velvet leaf or Indian mallow.

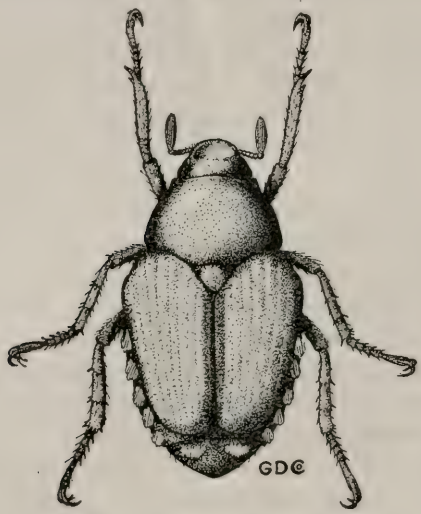


Fig. 9.—*Popilia japonica* Newm.

(*Abutilon avicennæ*), jewel weed (*Impatiens* sp.) and the blossoms of milkweed (*Asclepias syriaca*). In the nursery the beetles were found feeding on the foliage of *Ampelopsis quinquefolia*, flowering cherry, grape, elder, Crataegus, button bush, and in or on the flowers of double Althea, Spirea and *Vitex agnus-castus*. They were especially abundant on the foliage of the first three plants, and sometimes four or five were found buried in the double Althea flowers. On the smartweed as many as a dozen were found on single leaves. It was interesting to note that in the nursery, the beetles had apparently passed over the flowers and foliage of hydrangia and the foliage of Deutzia, peony and some other

plants and infested Althea blossoms and *Ampelopsis* foliage further away. Alfalfa, corn, tomatoes, pears in adjoining fields and cowpeas and pole beans in the nursery were uninfested, although the beans were close to the infested weeds. Smartweed in the midst of the cowpeas and tomatoes was badly eaten. The insects were found occasionally resting on other plants such as *Tamarix africana* in the nursery and corn silk in the field, but no feeding could be detected.

When disturbed during the heat of the day, the beetles would partly fall and fly off in a clumsy manner with a slight buzzing sound. On the whole they were quite active. Late in the day they were less active and would fall to the ground when disturbed. A number were noted in the attitude of copulation, but very few were found in copulo.

Mr. C. H. Uchida was kind enough to translate accounts of this insect as given in two Japanese text books. The first one is that given by S. Matsumura in his "Japanese Insect Pests," part 2, p. 247. He states that the beetles do considerable damage to string beans, grapes and certain wild beans; that the adults emerge in June and remain until September; that they are attracted by lights and controlled by hand picking and spring and fall plowing. The other account is that given by A. Fukatani in "Practical Methods of Destroying Insects on Horticultural Plants," p. 325. Mr. Fukatani gives the following account: The species feeds on string beans, peas, grapes and peanuts, the larvæ being found in the soil on the roots. The eggs are milky white, elliptical and about one-sixteenth of an inch in length. The larva is a characteristic white grub about three-fourths of an inch long, milky white, with a yellowish brown head. The pupa is about one-half inch in length, yellowish, covered with short hairs. The larva winters in the soil and pupates in May or June, the beetles emerging in July. Eggs are deposited singly in the soil and the larvæ moult several times before winter, the complete life cycle requiring one year. He also states that control is effected by jarring the beetles off the plants into a dish of oil and water; by jarring them from trees to a cloth spread below; by spraying with Paris green, lime and water; Paris green and Bordeaux mixture and by the use of Vaporite

in the soil, also that the use of organic manure and especially compost should be avoided.

From these two accounts it is evident that *Popilia japonica* is regarded as a pest in Japan. It was probably introduced into New Jersey in the larval stage in the soil around iris roots imported from that country. Japanese iris roots were first planted in the nursery where the infestation occurred about six years ago, and there have been two or three plantings of similar stock since that time. Azaleas imported from Japan have also been planted in this block but not previous to two years ago. Judging from the number of beetles observed, the insects must have been present more than two years. That it was not noticed sooner is due to the fact that its feeding is largely confined to weeds as has been stated. Its rate of dispersal is apparently very slow, as at the present time its feeding in the nursery is confined largely to that part where it apparently originated, and in the weeds outside of the nursery along the road it has not extended more than a few hundred yards. The fact that its rate of dispersal is slow is fortunate since if it became widely distributed it might become a serious pest on plants of the family *Polygonaceæ* such as buckwheat, and of the family *Vitaceæ*, such as grapes and perhaps on plants of other families such as cherry, etc.

While the Japanese account states that this insect infests leguminous plants, it is interesting to note that these plants remained uninfested although other plants in their midst were badly eaten, as has been mentioned above. The infestation in New Jersey is under careful observation; infested weeds and nursery plants are being treated with arsenic supplemented by hand picking. In this connection, it is interesting to note that where Ampelopsis was sprayed with arsenate of lead, the plants were practically free from the beetles, although previous to the spraying they were badly infested. No dead beetles were observed on the ground under the sprayed plants, but after careful observation it was found that some of both sexes had burrowed several inches into the soil under the infested plants. These beetles were very sluggish and had apparently been affected by the poison.

The beetle can be recognized from the following brief description: It measures a little less than one-half inch in length

and is similar in shape to species of *Euphoria*. The body and legs are metallic, bronze green in colour, save for the elytra which are reddish brown with dark margins. The lateral margins of the abdomen bear single tufts of conspicuous yellowish white hairs on each segment and a pair of these tufts on the exposed dorsal surface of the last segment. Each tuft extends downward forming a transverse line on the ventral surface, which becomes obsolete in the central portion. The ventral surface of the thorax and the basal segments of the legs are conspicuously hairy.

NOTES ON COCCIDÆ (HEMIPTERA).

BY G. F. FERRIS, STANFORD UNIVERSITY, CALIFORNIA.

It is the belief of the present author that more may now be accomplished by the redescription of many of our named species of Coccidæ than by the addition of new forms. Especially is it desirable that the types of many of the non-Diaspine genera be elucidated for the existing descriptions are, in certain cases, so inadequate that only the most vague and unsatisfying conception can be formed from them of the real character of the genera which they typify. Nor will the mere redescription of these forms in terms of the methods heretofore so generally employed by certain authors be sufficient. There must be an accompanying search for characters of real significance. Confidence in the all-sufficiency of the number of antennal segments and the character of the secretions as taxonomic criteria can no longer be maintained.

The present paper, therefore, is the first of a proposed series in which redescriptions of and notes upon the more interesting and more significant species available for study will be presented. Throughout these papers no references other than to the Fernald Catalogue and its supplements will be given, except in the case of some which may not be found therein.

Genus CRYPTOKERMES Hempel.

1903. Fernald, Catalogue of the Coccidæ, p. 88.

Monophleboid Coccidæ in which the adult female is entirely without legs or antennæ (and possibly without mouth-parts), remaining enclosed within the derm of the penultimate stage; penult-

imate stage with an anal tube which is formed by the chitinization of the posterior portion of the anal ring and not by the invagination of the posterior portion of the abdomen, with short, stout legs and antennæ and with mouth-parts; first larval stage in general resembling the first stage of Icerya, with slender, six-segmented antennæ, a well-developed anal tube, and with a series of long, slender setæ along the posterior margin of the body; all stages with six pairs of abdominal spiracles.

Type of the genus, *Cryptokermes brasiliensis* Hempel.

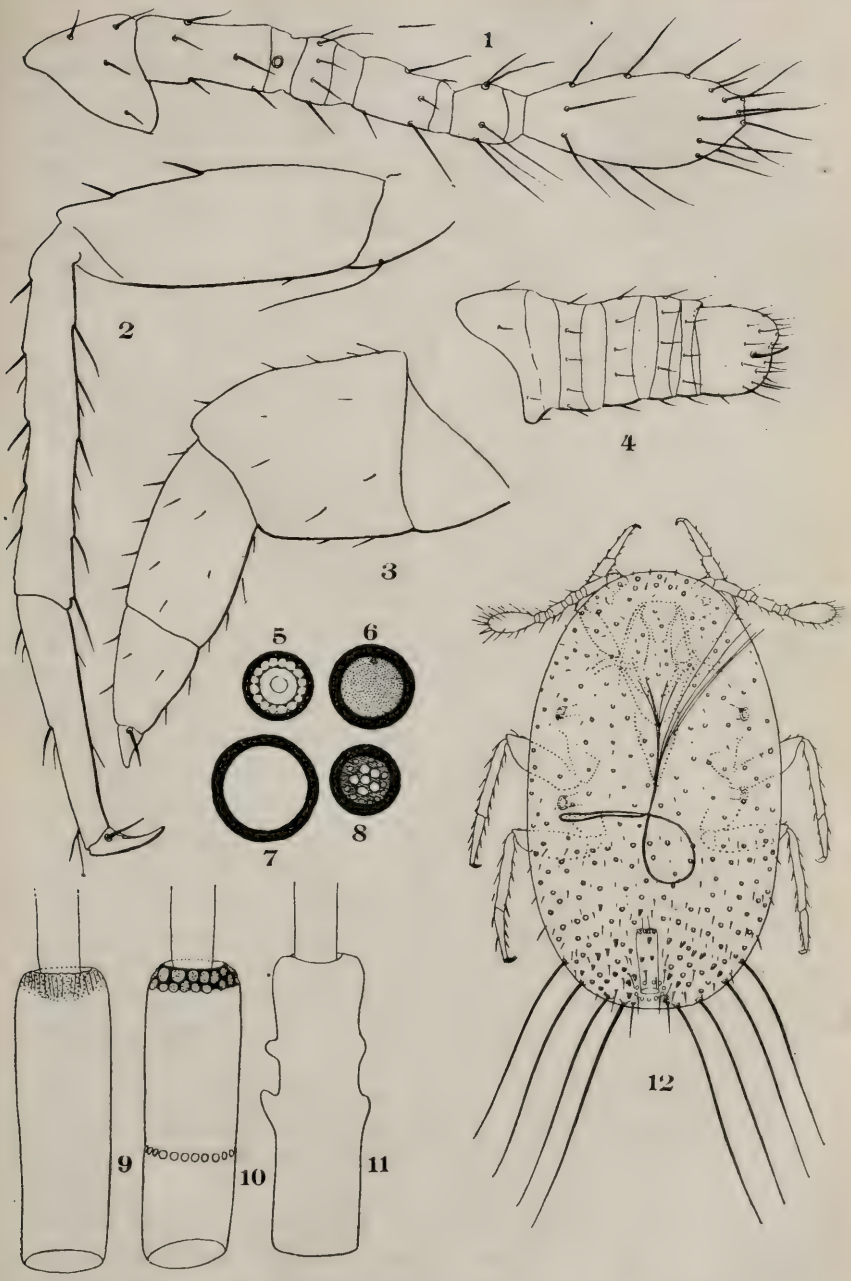
Notes on the genus.—In the Fernald Catalogue this genus is referred to the subfamily Dactylopiinæ, and is placed between *Ourococcus* and *Sphaerococcus*, apparently because of Cockerell's statement (1902) that "It is now clear that the genus is related to the Australian *Sphaerococcus* and *Ourococcus*." The real nature of the genera mentioned cannot well be determined from the existing descriptions, but it is fairly evident that *Cryptokermes* is related to neither of them. It is, in fact, unmistakably a Monophleboid form, the presence of the abdominal spiracles alone being sufficient evidence of this. I may say that in this opinion Mr. E. E. Green concurs.

The exact affinities of the genus are somewhat in doubt. The first stage larva is distinctly Icerya-like, while the intermediate stages are very similar to Xylococcus except for the presence of the short legs and antennæ. The absence of legs and antennæ in the adult female is unique in this group, although by no means uncommon in the Coccidæ.

Cryptokermes brasiliensis Hempel.

1903. Fernald, Catalogue of the Coccidæ, p. 88.

Adult female.—Length (flattened on slide) 5 mm. Derm membranous except for a large area of the dorsum (and possibly a portion of the venter) at the anterior end of the body, which is heavily chitinized. The eyes appear as two light spots in this chitinized area, which is thickly beset with short, spike-like spines. Remainder of the body sparingly beset with short, slender setæ, except about the vaginal orifice where the setæ are longer and more numerous. Dermal pores of the types shown in Fig. 5. The anal tube of the penultimate stage (in my specimens at least)



CRYPTOKERMES BRASILIENSIS Hempel.

(See p. 225.)

remains within the body of the adult female. Spiracles large and distinct.

The absence of mouth-parts may be apparent only, as they may possibly be obscured by the heavy chitinization of the anterior portion of the body.

Penultimate stage.—Length (flattened on slide) 4.5 mm. Globose in form. Derm everywhere quite heavily chitinized, especially toward the posterior portion of the body, and everywhere beset with many short, spike-like spines. Antennæ (Fig. 4) short and stout, six-segmented. Legs (Fig. 3) short and stout. Mouth-parts well developed, with a mentum present. Anal tube (Fig. 11) very heavily chitinized, its details not discernible in my specimens. In the specimens at hand the anal tube of this stage remains at the final ecdysis within the body of the adult female, a circular area of the derm of the penultimate stage surrounding the base of the tube remains attached to it, breaking away from the shed derm of this stage, and thus leaving an opening through which the eggs or larvæ probably escape. Dermal pores of the types shown in Figs. 6, 7 and 8, the type shown in Fig. 7 being merely a more or less irregular chitinized ring.

Second (?) stage.—Except for the unchitinized derm and the presence of but few spines, resembling the penultimate stage. The anal tube (Fig. 10) chitinized only at the inner end.

First stage.—In general much resembling an Icerya larva (Fig. 12). Antennæ (Fig. 1) 6-segmented, slender and presenting a clavate appearance, bearing numerous short hairs. Legs (Fig. 2) slender. Posterior end of the body with a series of eight long, slender setæ. Derm beset with many pores of the type shown in Fig. 6 and with a few pores of the type of Fig. 8, also with many short, slender setæ and toward the posterior end of the body with short, tubercle-like spines. Anal tube well developed, chitinized only at the inner end.

Material examined.—Specimens in the Stanford collection from *Mimosa* sp., Zapotlan, Mex., C. H. T. Townsend collector. Received from T. D. A. Cockerell and evidently a portion of the material recorded by him in 1902.

Notes on the species.—The adult female has not heretofore been described, that which both Hempel and Cockerell described

as this stage being in reality the penultimate stage. The form described by Cockerell as the first stage larva of this species is probably either incorrectly described or does not belong with this species, for he speaks of the presence of "figure-of-eight" pores and of projecting anal lobes. The form described by him as the second stage is what I here consider to be the first stage.

EXPLANATION OF PLATE IV.

Cryptokermes brasiliensis Hempel.

Fig. 1. Antenna of first stage larva.
Fig. 2. Leg of first stage larva.
Fig. 3. Leg of penultimate stage.
Fig. 4. Antenna of penultimate stage.
Fig. 5. Dermal pore of adult female.
Fig. 6. Dermal pore of first stage and succeeding larval stages.
Fig. 7. Dermal pore of second (?) and penultimate stages.
Fig. 8. Dermal pore of larval stages.
Fig. 9. Anal tube of first stage larva.
Fig. 10. Anal tube of second (?) stage larva.
Fig. 11. Anal tube of penultimate stage.
Fig. 12. First stage larva.
Note.—Antennæ and legs only drawn to uniform scale.

THE HEATH COLLECTION OF LEPIDOPTERA.

(Continued from Vol. XLIX, p. 92.)

BY J. B. WALLIS, WINNIPEG, MAN.

The Geometridæ were, in cases of doubt, submitted to Mr. A. F. Winn or to Drs. Barnes and McDunnough.

In all the following species it was considered advisable to give the changes as indicated by the new check list. But as it is improbable that the collection will be re-arranged for a considerable period; the order of the species in the collection, that is, of the Smith list, is adhered to. The names in brackets are those given in Drs. Barnes and McDunnough's list.

Geometridæ.

3504 *Nyctobia nigroangulata* Strck.
3508 *Rachela bruceata* Hulst. Rare in Manitoba.

3513 *Paleacrita vernata* Peck.
3515 *Alsophila pometaria* Harr. Rare in Manitoba.
3516 *Eudule mendica* Wlk.
3524 *Talledega* (*Lobophora*) *tabulata* Hulst.
3545 *Tephroclystis* (*Eupithecia*) *ornata* Hulst.
3546 " " *miserulata* Grt.
3563 " " *absinthiata* Clerck. Not North American according to the new list.
3591 *Tephroclystis* (*Eupithecia*) *ravocostaliata* Pack.
3595 *Eucymatoge* (*Eupithecia*) *anticaria* Wlk.
3599 " (*Horisme*) *intestinata* Guen. A badly worn specimen of this stood as "*vitalbata*."
3604 *Euchoeca* (*Trichodesia*) *albovittata* Guen.
3606 " (*Eupithecia*) *cretaceata* Pack.
3608a " (*Hydrelia*) *brunneifasciata* Pack.
3612 *Hydria* (*Calocalpe*) *undulata* Linn.
3620 *Eustroma* (*Lygris*) *diversilineata* Hbn.
3621 " " *testata* Linn. Stood as "*populata*."
3622 " " *propulsata* Wlk. Stood as "*testata*."
3623 " " *destinata* Moeschl. var.
3624 " " *triangulata* Pack. Stood as "*destinata*."
3628 " " *cunigerata* Wlk.
3631 *Rheumaptera* (*Eulype*) *hastata* Linn.
3632 " (*Epirrhöe*) *tristata* Linn.
3633 " " *sociata* Bork. (*alternata* Mull.)
3642 *Percnoptilota* (*Orthonama*) *fluviata* Hbn. (*obstipata* Fab.)
3643 *Mesoleuca ruficillata* Gn.
3646 " (*Xanthorhöe*) *lacustrata* Gn.
3648 " (*Euphyia*) *intermediata* Gn. Stood in part as *Cymatophora flavicaria* and what are apparently badly worn specimens of this as *Xanthorhöe montanata*.
3651 *Mesoleuca* (*Dysstroma*) *truncata* Hufn.
3655 " " *hersiliata* Gn.
3659b *Hydriomena nubilofasciata* Pack.
3660 " *autumnalis* Strom. (*cærulata* Fab.) This and the preceding stood as *Mesoleuca hersiliata*. *Hydriomena ruberata* Frey.
3663 " *californiata* Pack.

3665 *Hydriomena reflata* Grt.
3673 " (*Euphyia*) *multiferata* Wlk.
3674 " (*Euphyia*) *latirupta* Wlk (*centrostrigaria* Woll.) Stood as *Xanthorhöe ferrugata* and *munitata*.
3689 *Triphosa hæsitata* Gn. Correctly and also as *dubitata*.
3710 *Gypsochroa* (*Xanthorhöe*) *designata* Hufn.
3731 *Xanthorhöe munitata* Hbn.
3732 " *ferrugata* Clerck. Stood as *munitata*.
3743 *Hæmotopis grataria* Fab.
3751 *Mycterophora slossoniæ* Hulst. (*inexplicata* Wlk.)
3752 *Deptalia insularia* Gn. (*Pleuroprucha insulsaria* Gn.)
3755 *Cosymbia lumenaria* Hbn.
3762 *Synelys ennucleata* Gn. (*Ocidalia enucleata* Gn.)
3769 *Xystrota hepaticaria* Gn.
3772 *Cinglis similaria* Wlk. ("Probably" McD.) (*Cabera erythemaria*.)
3773 *Cinglis* (*Acidalia*) *purata* Gn.
3775 " " *ancellata* Hulst. "Apparently" McD.
3786 *Leptomeris* (*Holarctias*) *sentinaria* Geyer. Stood as *magnetaria*.
3820 *Eois persimilis* Hlst. (*Acidalia junctaria* Wlk.).
3821 " (*Ptychopoda*) *inductata* Gn.
3834 *Annemoria* (*Cheteoxelis*) *bistriaria* Pack.
3841 *Nemoria* (*Chlorissa*) *subcroceata* Wlk.
3845 *Eucrostis* (*Mesothea*) *incertata* Wlk. In the series with the preceding.
3857 *Synchlora denticularia* Wlk. Stood as *liquoraria*.
3864 *Chlorosea* (*Memoria*) *mimosaria* Gn.
3881 *Epelis faxonii* Minot. (*Isturgia amitaria* Gn.).
3882 *Eufidonia notataria* Wlk.
3883 *Orthofidonia exornata* Wlk. (*tinctaria* Wlk.).
3884 " (*Bapta*) *semiclarata* Wlk.
3885 " " *vestaliata* Gn.
3896 *Gueneria basiaria* Wlk. Stood as *Deilinea erythremaria*.
3897 *Deilinea* (*Cobera*) *borealis* Hulst.
3900 " " *variolaria* Gn.
3926 *Sciagraphia* (*Macaria*) *granitata* Gn.
3927 " " *denticulata* Grt.

3940 *Sciagraphia* (*Phasiane*) *meadiaria* Pack. Stood as *continuata*.
3943 " (*Phasiane*) *mellistrigata* Grt.
3946 *Philobia enotata* Gn. (*æmulataria* Wlk.).
Macaria (*Phasiane*) *ordinata* Wlk.
3969 *Cymatophora* (*Itame*) *ribearia* Fitch.
3970 " " *sulphurea* Pack.
3971 " " *occiduaria* Pack.
3989 " " *pustularia* Hbn.
4015 " " *inquinaria* Hulst. (*quadrilinearia* Pack.).
4027 *Sympherta julia* Hulst (*Dysmigia loricaria* Evers).
4068 *Alcis* (*Hesperumia*) *sulphuraria* Pack.
4608a " " *baltearia* Hulst.
4090 *Paraphia subatomaria* Wood.
4138 *Cleora indicataria* Wlk.
4140 " *pampinaria* Gn.
4145 " *larvaria* Gn.
" *takenaria* Pears. (*ephyraria* Wlk.).
4148 *Melanolophia canadaria* Gn.
4153 *Ectropis crepuscularia* Schiff. Stood as *Cleora inductaria* and *Sabulodes umbrosarium*.
4156 *Lycia ursaria* Wlk.
4158 " (*Amphidasis*) *cognataria* Gn.
4164 *Nacophora quernaria* S. & A.
4175 *Erannis tiliaria* Harris.
4177 *Cingilia catenaria* Dru.
4182 *Dyscia orciferata* Wlk. (*Aspilates orciferaria*).
4189a *Anagoga occiduaria* Wlk.
4193 *Sicya macularia* Harr.
4202 *Therina* (*Ellopia*) *fiscellaria* Gn.
4206 *Metrocampa prægrandaria* Gn. (*Campæa perlata* Gn.).
4209 *Eugonobapta nivosaria* Gn.
4216 *Ennomos magnarius* Gn.
4218 *Xanthotype crocotaria* Fab.
4218a " *cælaria* Hulst.
4224 *Plagodis phlogosaria* Gn. probably.
4227 *Hyperetis amicaria* H. S.
4232 *Ania limbaria* Haw. (*Nematocampa limbata* Haw.).

4236 *Gonodontis duaria* Gn. Stood in part as *warneri*.
4247 *Euchlæna obtusaria* Hbn.
4248 " *effectaria* Wlk. (*effecta* Wlk.). Mixed with *obtusaria*.
4251 *Euchlæna johnsonaria* Fitch.
4254 " *astylusaria* Wlk. Probably. This was under *marginata* and *amoenaria*.
4255 *Euchlæna marginata* Minot. Mixed with *pectinaria*.
4256 " *pectinaria* D. & S.
4261 *Eutrapela* (*Selenia*) *alciphearia* Wlk.
4272 *Metanema inatomaria* Gn.
4273 " *determinata* Wlk.
4281 *Priocycla armataria* H. & S.
4292 *Azelina ancetaria* Hbn. (*Pero honestarius* Wlk.).
4299 *Caberodes* (*Apicia*) *confusaria* Hbn.
4300 " " *majoraria* Gn. = *confusaria*, according to the new list.
4304 *Tetracis crocallata* Gn.
4307 *Sabulodes arcasaria* Wlk.
4309 " *lorata* Grt.
4319 " *transversata* Dru.
4321 *Abbotana clemataria* S. & A.
4330 *Brephos infans* Moeschl. One only.
4333 *Leucobrephos brephoides* Wlk.

Epiplemidæ.

4336 *Callizzia amorata* Pack.

(To be continued.)

NEW SPECIES OF MICROLEPIDOPTERA.

BY ANNETTE F. BRAUN, CINCINNATI, OHIO.

HELIODINIDÆ.

Erineda aenea, n. sp.

Palpi and face pale buff, head yellowish, slightly purplish opalescent or brownish in the female. Basal segment of antennæ yellowish, stalk clothed with dark brown scales, except the last six or seven segments which are white. Antennæ of male with long, sparse ciliation in the basal half, with short cilia in the apical half. Thorax purplish opalescent. Fore wings dark golden brassy,

becoming darker towards apex. A velvety dark brown spot at base of costa is surrounded by opalescent purple, which gradually fades into the ground colour. The purplish opalescence is less noticeable in the female. Hind wings brownish brassy. Hind tibiæ bright yellow, with upper edge and spines orange-tinged, apex black; hind tarsi blackish above, whorls of spines yellowish. Abdomen concolorous with hind wings at base, dark brown toward tip, anal tuft in male yellowish.

Expanse 8–9 mm.

Localities.—Cincinnati, O.; Clermont Co., O.

Type and two paratypes in author's collection.

This species may be distinguished from *E. elyella* Busck by the larger basal brown spot, much darker colour, with absence of dorsal light streak, and by the different antennal coloration and structure.

The larvæ feed on the spores of two species of ferns, the narrow-leaved spleenwort (*Asplenium angustifolium*) and the silvery spleenwort (*A. acrostichoides*). A web, beneath which the larva feeds, is spun along the underside of the leaflet, often extending for three-fourths its length by the time the larva reaches maturity. When young the larva mines into the sorus, eating out the greater portion of the spores and leaving the indusium hollow. Later the larva becomes too large to mine and consumes the entire sorus, except the annuli of the sporangia, in many places leaving only the ridge along which the indusium was fastened to the leaf, indicating perhaps that this is also consumed in addition to the spores. Near the beginning of the web, and to one side of the midrib, a circular opening leads to the upper side. Protecting the opening on the upper side, and broadest and thickest just over the opening, is a tubular web tapering and crossing the midrib diagonally. It is somewhat raised at the beginning, but flattens toward its narrow end, where there is an opening through which the larva ejects the frass. On the underside of the leaf, the web is also thickest over the circular hole. The web is decorated with the innumerable rejected annuli of the sporangia, which cover closely those portions around the circular opening, both on the upper and under surfaces of the leaf, thus affording protection to the larva when not feeding. The larva while feeding is yellowish

white with slightly darker head and prothoracic shield; at maturity it turns to a bright vermilion orange colour. It spins a double cocoon of very fine, white silk, broadly oval, with one end a little more pointed, the inner cocoon more elongate than the outer.

The larvæ may be found in September; the exact time of reaching maturity depends upon the time of spore production in the ferns. *Asplenium acrostichoides* produces fertile fronds and ripe spores a couple of weeks in advance of *A. angustifolium*. Where both species of ferns occur together, full-grown larvæ may be collected on the former species when the larvæ on the latter have eaten but one or two sori on each side of the midrib. The imagos emerge during the latter part of July and early August.

In repose the moth rests with the brightly coloured hind legs raised above the body.

YPONOMEUTIDÆ.

Argyresthia pallidella, n. sp.

Palpi pale yellowish white, fuscous beneath. Face and head yellowish white, tuft almost white, antennæ grayish yellow, annulate with dark brown. Thorax and fore wings pale shining yellowish white; extreme costa in the basal fourth dark brown. Cilia whitish. Hind wings very pale gray or concolorous with the fore wings, cilia whitish. Legs whitish, tibiæ and tarsi of the first pair fuscous. Abdomen brownish yellow at base, gray behind except tip, which is whitish yellow.

Expanse 11 mm.

Locality.—San Barnardino Mts., California, July 7.

Type and paratype in author's collection.

The specimens were collected amongst fir, which is perhaps the food plant. This species is very similar to *A. laricella* Kearf, the chief difference being the darker annulated antennæ.

Swammerdamia cuprescens, n. sp.

Head and face white; palpi white with fuscous under surface; basal segment of antenna white, stalk dark fuscous, annulate with pale gray. Thorax white, very sparsely sprinkled with pale gray specks. General colour of the fore wing pale gray, due to gray-tipped whitish scales, with the base of the wing somewhat darker gray. There is a dark gray half-crescent-shaped mark situated at the basal third of the dorsum, curving slightly outwards and

not reaching the costa. There are some longitudinal series of dark fuscous spots lying chiefly near the costa and dorsum. At the beginning of the cilia is a white costal spot; beyond it the apical portion of the wing is dark fuscous, the fuscous shade usually extending downward to the dorsum. Cilia dark with a coppery lustre and a dark fuscous line through the middle. Hind wings pale gray, closely irrorated with fuscous. Legs pale gray; tibiæ and tarsi of the first pair and tibiæ of the second pair dark fuscous; tarsal segments tipped with fuscous. Abdomen gray.

Expanse 12.5–13.5 mm.

Locality.—Field, B.C.

Type and two paratypes in author's collection; one paratype in the collection of the Entomological Branch, Department of Agriculture, Ottawa.

Four specimens bred from larvæ in webs on birch (*Betula glandulosa*), Field, B.C. Larvæ were also collected on alder at Glacier, B.C., but no moths were reared. Larvæ collected in August, pupated in a few days, and the moths appeared in the breeding jars in April and May of the following year.

This species differs from the European *S. heroldella*, also a birch feeder, by the distinct coppery lustre of the cilia.

Xyrosaris ochroplagiata, n. sp.

Palpi white with under surface irrorated with blackish, except towards apex. Face dusted; head pure white; antennæ white with fuscous annulations. Thorax white slightly dusted. Base of wings irrorated with fuscous-tipped scales, blackish toward costa; beyond this is a pale ochreous, almost undusted area, extending obliquely from costa to dorsum, and broadening toward the dorsum, occupying approximately one-fourth the wing area; remainder of the wing covered with more or less deeply fuscous-tipped white scales, mingled with patches of whitish and ochreous. Immediately following the basal ochreous area, near middle of dorsum is a small, curved, white streak, margined outwardly with a patch of scales, darker tipped than general over the wing. A similar dark patch on costa opposite. A white costal spot at beginning of cilia. Several rows of very minute tufts of black scales; immediately below costa, along middle of wing, just above fold, and one or two of a fourth row below fold on outer half of wing; the largest tufts

are those at the basal third and above the tornus belonging to the row above the fold. Cilia ochreous, with a line of dark-tipped scales. Hind wings gray, with a faint ochreous tinge; cilia gray, ochreous at extreme bases. Fore and middle legs closely irrorated with fuscous, hind legs sparsely speckled. Abdomen gray, margins of segments whitish.

Expanse 11.5 mm.

Locality.—Winnfield, La., June 26 (G. R. Pilate).

Type in author's collection.

GRACILARIIDÆ.

Acrocercops affinis, n. sp.

Palpi with whitish ground colour more or less obscured with fuscous dusting; second segment of labial palpus white on the under surface, elsewhere fuscous; third segment whith the base white followed by a narrow, blackish annulus which is succeeded by a narrow whitish annulus, remainder of segment fuscous. Antennæ fuscous faintly paler annulated. Head whitish more or less densely streaked with fuscous. Fore wings brownish fuscous, dusted, marked with a series of ten transverse whitish strigulæ, the first eight equidistant, the last two in the apical cilia; these strigulæ are most distinct on the costa, obsolete or ill-defined where they cross the middle of the wing, and ending in whitish spots on the dorsum. The first streak is usually nearly obsolete; the fourth ends in a whitish blotch on the dorsum; the seventh is more oblique and more clearly defined in the middle of the wing than the preceding ones; the eighth encloses the apex. The fifth streak on the costa is sometimes double. The ground colour is more or less darkened on the margins between the streaks, especially between the fourth and fifth, and sixth and seventh costal streaks; and between the second and third, and fourth and fifth dorsal streaks. Hind wings and cilia gray. Legs whitish banded with fuscous. Abdomen gray.

Expanse 9.5–10 mm.

Localities.—Yosemite National Park, California; San Bernardino Mts., California.

Types in author's collection.

A large series bred from upper side blotch mines on oak, both deciduous and evergreen. The mine starts as a narrow, white

line, expanding abruptly into a large, white blotch, within which the parenchyma is to a large extent consumed. Cocoon oval, brownish, ornamented with a few whitish globules. Larvæ collected June 20 (San Bernardino Mts.); July 26 (Glacier Point, Yosemite), at which time they were nearly full grown, produced imagos in about two weeks.

Closely allied to *A. strigosa*, from which it differs by having the transverse lines broken and less distinct and a little more irregularly placed.

Ornix spiraeifoliella, n. sp.

Palpi grayish white, face grayish white, tuft of gray and whitish scales intermixed, antennæ gray, faintly annulate. Thorax and fore wings uniform shining seal brown; a white line on each side of the thorax is continuous with a broad, white basal streak above the fold to one-fifth; base of dorsum narrowly and indistinctly white; from one-third of costa a very oblique costal streak narrowing below costa into faint line, then expanding in the middle of the wing, where it meets, almost at right angles, the apex of a less oblique streak from the middle of the dorsum. A second slightly oblique spot at the middle of costa; somewhat oblique narrow costal and dorsal streaks at two-thirds meeting in the middle of the wing; following them a pair of inwardly oblique streaks. A large triangular, white costal spot lying chiefly in the cilia just before apex, is more or less distinctly divided into two by a gray streak; opposite it a white spot in the terminal cilia; cilia elsewhere concolorous with wing; extreme apex of wing slightly darker than ground colour. Hind wings and cilia gray. Legs gray, banded with white.

Expanse 6.5 mm.

Locality.—Field, B.C.

Type in author's collection.

The larva mines the underside of leaves of *Spiræa* sp., making a much wrinkled mine in which the parenchyma is entirely consumed; in the breeding jar the larva on leaving the mine, folded the leaf inwards with upper surfaces together; later made a fold on to the underside in the usual way; cocoon in a folded edge of the leaf. Larva collected August 22; moth the following spring.

A very distinct species, belonging in the group of *guttea*, *kalmiella* and *preciosella*.

Gracilaria hypericella, n. sp.

Face whitish; palpi whitish, with the tip of the maxillary palpi and the tip of the second segment of the labial palpi and outer and upper surface, and sometimes the entire apical half of the third segment except the extreme tip, blackish. Head ochreous, more or less overlaid with fuscous purple. Ground colour of the fore wing ochreous, more or less overlaid with shining purplish fuscous; usually the costal third of the wing, except toward base and in the apical fourth, is comparatively free from purplish dusting. There is a series of minute fuscous dots on the costal edge; in darker specimens sometimes indistinctly continued across the wing. The dark scales form an indistinct spot in the middle of the disk. Cilia fuscous, with three or four indistinct, darker lines running through them. Hind wings and cilia gray. Fore and middle legs black, except the tarsi; hind legs whitish dusted with fuscous; tarsi white with black tips.

Expanse 8.5–10 mm.

Localities.—Cincinnati, O.; Clermont Co., O.

Types in author's collection.

Seventeen specimens, reared from larvæ on St. John's Wort, *Hypericum cistifolium*, and *H. punctatum*. The larva makes a small linear mine, usually distinctly visible on the upper side of the leaf; this mine enlarges into an elongate blotch on the underside, 7 or 8 mm. long and 2 mm. or less wide, which becomes tentiform, resembling a minute Lithocolletis mine. The cone is rolled from the tip of the leaf downward on to the lower side, usually taking up the entire small leaf. The cocoon is spun on the underside, the leaf being curled over so as entirely to conceal the cocoon. On leaves of *Hypericum cistifolium*, the cocoon is almost always placed near the tip over the midrib, and the leaf on both sides is curled over the cocoon. Larvæ and cocoons collected July 20 and August 27; one captured specimen July 8.

This species is close to *G. desmodiella*, but lacks the violet tint of that species and the discal spot is never distinct.

Gracilaria ferruginella, n. sp.

Labial palpi densely dusted with reddish fuscous outwardly, yellowish on inner side, with third segment slightly dusted except at extreme tip; third segment thickened with scales to near apex. Head and thorax purplish brown, slightly mixed with ochreous.

Antennæ purplish fuscous, annulate with ochreous. Fore wings purplish brown, somewhat mixed with ochreous; rarely the ochreous predominates. Beneath the fold irrorated with blackish fuscous; these blackish scales are aggregated into a large spot beneath the trigonal mark. Wing sprinkled with whitish or ochreous spots along the fold. An indistinctly outlined trigonal spot at one-third, is marked on the costa by a series of black spots, usually two larger followed by four small ones; between the trigonal spot and an elongate ochreous spot beyond, the ground colour deepens on the costa to blackish fuscous. The second spot is also marked on costa with blackish dots. Sometimes the trigonal marks are obliterated by fuscous purplish ground colour which then suffuses almost uniformly the entire wing. A few ochreous costal spots along margin from beginning of cilia; one at extreme apex; more conspicuous whitish spots along termen; sometimes irregularly placed whitish dots along dorsal margin. Cilia rust red, especially at their bases and along termen near tornus; conspicuously marked with a dark brown band which crosses in a broad curve from the tips of the costal cilia to the tips of the terminal cilia just beyond the tornus, almost touching the apex; tips also of the apical cilia dark brown. Hind wings and cilia gray. Fore and middle legs closely dusted with fuscous purple, tarsi white with black tips; hind legs gray. Abdomen gray.

Expanse 15 mm.

Localities.—Yosemite Valley, California; Mt. Tamalpais, Marin Co., California; San Bernardino Mts., California.

Types in author's collection.

Three specimens, from larvæ on Azalea, *Rhododendron occidentale*, from Yosemite, and a series of about twenty-five captured specimens.

The larva makes a tentiform mine on the under surface of the leaf, later rolling the leaf from tip down into a cone. The cocoon is whitish elongate. The larvæ were collected July 29, yielding moths about the middle of August; the captured specimens were taken July 9 to 30.

The markings of the cilia are the most distinguishing characteristic of this species. In some of its forms it approaches varieties of *G. alnivorella*, from which the markings in the cilia and thickened palpal segment will always separate it.

NOTES ON THE NORTH AND CENTRAL AMERICAN SPECIES OF ACANTHOCEPHALA LAP.

(Fam. Coreidæ: Heteroptera.)

BY EDMUND H. GIBSON AND ABBY HOLDRIDGE, U. S. BUREAU OF ENTOMOLOGY, WASHINGTON, D. C.

An exceptionally good and large series of specimens of the genus *Acanthocephala* Lap. in the collection of the U. S. National Museum has afforded the writers an opportunity for detailed study of this group, and has enabled them to untangle several of the perplexing questions in regard to the identity of species.

Acanthocephala is a neotropical genus and contains a rather long list of described species. However, it seems warranted to believe that with further study of South American material the number of species will be reduced as many will probably be forced into synonymy. Seven species are known to occur in Central America, five of which are also to be found in southern United States.

Previous workers have divided the genus into two subgenera, according to the variation in the form and shape of the thorax, but as this character exhibits great variability within a species and the form and the shape of the dilatation of the hind tibia is certainly of more value in separating the species and is constant within a species, the present authors feel justified in not recognizing the old subgeneric divisions and are even restrained from forming new ones.

Acanthocephala was described by Laporte in 1832, Ess. Hem., p. 29, and may be characterized as follows:

Head short, terminating in a spine as viewed from above. Antennæ long and slender, first joint stouter than the rest and slightly longer than the length of the head, fourth joint usually somewhat curved. Thorax wider than elytra. Membrane extending slightly beyond apex of abdomen. Posterior femora more or less swollen, sometimes greatly so and curved, armed with prominent spines.

Posterior tibia with dilatations on either side, the outer dilatation the widest and longest.

It is the largest and best known genus of the tribe *Acanthocephalini* Stal. The orthotype of the genus is *latipes* Drury.

The following key to the species includes all those occurring in Central and North America.

KEY.

1. Thorax greatly expanded laterally beyond margin of abdomen and elytra. Thorax prominently concave.....*declivis* Say.
   Thorax wider than abdomen but not greatly expanded, not prominently concave.....2
2. Dilatation of posterior tibia very small and limited to basal third. Inner margin of posterior tibia spinous in male. Femora of male greatly swollen.....*bicoloripes* Stal.
   Dilatation of posterior tibia noticeably greater, inner margin of male comparatively smooth.....3
3. Outer dilatation of posterior tibia in both sexes very broad, widened at apex and broadly rounding.....*latipes* Drury.
   Form of dilatation of posterior tibia not as above.....4
4. Outer dilatation of posterior tibia in both sexes broad to almost the very tip, but not widened at apex. Large species.....*granulosa* Dall.
   Outer dilatation of posterior tibia not wide at or near the apex. If it extends to near the apex then much narrowed.....5
5. Species small. Dilatation of posterior tibia in both sexes extending but two-thirds or slightly more the entire length of tibia.....*terminalis* Dall.
   Species large. Dilatation of posterior tibia extending distinctly more than two-thirds the length of tibia, sometimes to nearly the apex.....6
6. The outer dilatation of posterior tibia of male without distinct scallops. Hind femora of male usually greatly swollen and bowed. Female broad. Thorax prominently tuberculate.....*femorata* Fabr.
   The outer dilatation of posterior tibia of male with distinct scallops. Hind femora straight and not as greatly swollen. Female comparatively more narrow. Thorax minutely tuberculated.....*confraterna* Uhl.

Acanthocephala bicoloripes Stal.

Metapodius bicoloripes Stal., Ofv. Vet. Ak. Forh. p. 184, 1855.

This species may easily be distinguished from all others by the small and extremely short dilatation of the posterior tibia which is limited to the basal third of the tibia. The apical two-thirds of the posterior tibia in the female is slender and slightly spinous along inner margin, while in the male it is gradually narrowing and distinctly and coarsely spinous. The hind femora of the male is greatly swollen and somewhat curved as in *femorata* Fabr. It is a distinctly smaller species than *femorata* Fabr.

It has been recorded from Costa Rica and Columbia. All specimens examined are from the first mentioned country.

Acanthocephala femorata Fabr.

Cimex femorata Fabricius, Syst. Ent., p. 708, 1775.
Rhinuchus nasula Say, New Harm. Indiana, p. 10, 1832.
Metapodius bispinus Westwood, in Hope Cat., II., p. 15, 1842.
Metapodius obscura Westwood, in Hope Cat., II., p. 15, 1842.
Metapodius luctuosa Stal., Œv. Vet. Ak. Forh., p. 184, 1855.

Of all the species this one shows the greatest variability, both in male and female. The variations are most notable in the general size of the bug and character of its posterior femora. The posterior femora of the male varies from one extreme in being very greatly swollen and prominently curved, to the other extreme of being only normally swollen and almost straight. Innumerable gradations between the two are to be found. The character of the dilatation of the posterior tibia is, however, stable.

This species has been recorded from all of the Southern States, and is also known to occur in Mexico and Central America.

Acanthocephala confraterna Uhl.

Metapodius confraterna Uhler, Proc. Bost. Soc. Nat. Hist., vol. XIV, p. 99, 1871.

In general this species most nearly resembles the preceding; especially is this so with the females. The character of the dilatation of the posterior tibia of the male is like that exhibited in *terminalis* Dall. The posterior femora of the male are more slender and not so curving as in *femorata* Fabr. The females are somewhat longer and narrower than in *femorata* Fabr. The species is noticeably larger than *terminalis* Dall.

The species examined are from Florida and Texas.

Acanthocephala terminalis Dall.

Metapodius terminalis Dallas, List of Hem., II, p. 432, 1852.

Metapodius instabilis Uhler, Proc. Bost. Soc. Nat. Hist., vol. XIV, p. 98, 1871.

This is the smallest species of the genus and is the most constant in its characters. Normally it is very dark, almost black. The posterior femora in the male is only slightly larger than in the female.

The authors are unable to separate Uhler's *instabilis* from this species, and feel warranted in placing it in synonymy with *terminalis* Dall.

Specimens in the National Museum collection record its distribution from New York west through Illinois and Missouri and south to Texas.

Acanthocephala granulosa Dall.

Metapodius granulosa Dallas, List Hem., II, p. 430, 1852.

Diactor alata Herr.-Sch., Wanz. Ins., VI, p. 53, 1842.

Metapodius thomasii Uhler, Hayden's Surv. Mont., p. 339, 1872.

The wide dilatation of the posterior tibia which extends to the apex is characteristic of this and the following species. In *latipes* Drury, however, the dilatation is widened and broadly rounded at the apex, while in this species it is slightly and gradually narrowed. Typical specimens have their elytra of a distinct mahogany brown. The long, bright orange fourth antennal segment with the bright orange tibia of the first two pairs of legs are also characteristic. It is a large species and is known to occur in Arizona, New Mexico and Texas, as well as throughout Central America.

Acanthocephala latipes Drury.

Cimex latipes Drury, Ill. Nat. Hist., III, p. 62, 1782.

Lygaeus compressipes Fabr., Syst. Rhyng., p. 209, 1803.

Acanthocephala albicollis Dall., List, III, p. 427, 1852.

The characters as mentioned in the key to the species will suffice to distinguish this species. It might also be remarked that the fourth antennal joint is extremely long, and the posterior-lateral angles of the thorax terminate in almost a spine.

Specimens are at hand from Panama and Costa Rica.

Acanthocephala declivis Say.

Acanthocephala declivis Say, New Harm. Ind., 1832.

Diactor alata Burm., Handb., II, I, p. 334, 1835.

Metapodius thoracicus Dall., List, II, p. 428, 1852.

Acanthocephala subalata Distant, Biol. Cent. Amer., p. 119, 1881.

The extremely wide and concave thorax readily separates this species, although the shape of the posterior lateral angles varies a great deal. These are broadly rounding in some specimens, in others acutely pointed, with every intergradation to be found. The form of the dilatation of the posterior tibia places it with *latipes* Drury and *granulosa* Dall. The general size varies from specimens as small as *terminalis* Dall. to those larger than *granulosa* Dall.

The species is known to occur throughout Central America and north into southern United States.

THE BLACK CHERRY APHIS, *MYZUS CERASI.*

On page 434 of the Canadian Entomologist for 1917, Mr. W. A. Ross calls attention to the fact that in my paper before the California State Fruit Growers' Convention in 1914, the black cherry aphis was referred to as a species not having alternate food habits. Since that date we have recorded this species a few times in small numbers upon water cress, collected by L. B. Bragg. However, our observations and records indicate that this aphid continues throughout the year upon the cherry in Colorado, and we have never found it abundant upon the alternate host.

No one in the department recalls seeing this species upon the sweet cherries—Royal Ann, Bing, Black Tartarin, Black Republican, etc., and we can recall but very few cases where it has been seen in any abundance upon the semi-acid cherries, the Dukes, but it is a common and, often, abundant louse upon the sour red cherries, English Morello, Montmorency wragg and their like, on the eastern slope of the mountains. It yields readily to the application of the contact insecticides as the leaves do not curl enough to give protection to the lice.

C. P. Gillette.

NEW NEARCTIC CRANE-FLIES (TIPULIDÆ, DIPTERA) PART V.

BY CHARLES P. ALEXANDER, UNIVERSITY OF KANSAS, LAWRENCE, KAS.

(Continued from page 165.)

Genus *Tricyphona* Zetterstedt.

Tricyphona protea, new species.

General coloration pale yellowish brown; wings with the free portion of vein R_2 very long, only a little shorter than the sector; cell R_4 short-petiolate; cell *1st* M_2 open by the atrophy of *m*.

Male.—Length 6.4 mm.; wing, 6.5 mm.

Described from an alcoholic specimen.

Rostrum and palpi pale; palpal segments nearly subequal, the fourth a little longer than the third and more slender. Antennæ dark brown, the basal segments paler; flagellar segments oval, the terminal segment not elongated. Head yellowish, darkest on the vertex.

Thorax light yellowish brown without apparent darker stripes. Halteres short, pale, the knobs large. Legs with the coxæ and trochanters dull yellow; remainder of the legs broken. Wings a pale yellowish tinge; veins yellowish brown. Venation: Sc_1 ending just before the fork of R_{2+3}; Sc_2 some distance before the origin of the sector, this distance about equal to the basal deflection of Cu_1; vein R_2 fused with R_1 for a short distance back from the wing-margin, this fused portion about equal to *r-m*; petiola of cell R_4 short, less than *r-m*; cell *1st* M_2 open by the atrophy of *m*.

Abdominal tergites dark brown, paler laterally; sternites dull yellow; apices of the segments darker brown; hypopygium dull yellow.

Habitat.—Washington.

Holotype.—♂, Mt. Rainier, Washington.

In many respects this is a very remarkable fly, easily told from all its relatives by the great length of vein R_2 before its fusion with R_1. I have pointed out in another paper the reasons for changing the nomenclature of the radial veins in the Pediciini, this vein R_2 having been hitherto considered as being the radial cross-vein.

July, 1918

SUBFAMILY TIPULINÆ.

Genus *Tipula* Linnæus.

Tipula margarita, new species.

General coloration of the head and thorax light gray; antennæ short, black, the three basal segments orange-yellow; femora with a broad, subterminal yellow ring; wings with four brown cross-bands; abdomen yellow, the tergites with a broad, dark brown median and narrow dark brown sublateral stripes; lateral margin of the tergites broadly light gray; male hypopygium with the ninth tergite large, subquadrate, with a deep median split; ninth pleurite complete.

Male.—Length about 13 mm.; wing 14.4 mm.

Frontal prolongation of the head long, grayish above, more reddish laterally, nasus long and slender. Palpi with the first segment reddish, the remainder black. Antennæ with the first segment long and slender, orange-yellow, a little grayish pruinose on the basal fourth; segments two and three orange-yellow, remaining flagellar segments dark brown, the apices only a little more reddish; flagellar segments very short with long verticils, the basal swelling inconspicuous, only a little thicker than the rest of the segment. Head gray, on the disk of the vertex suffused with brown; vertical tubercle prominent, narrowly split by a deep, impressed median line; occiput more reddish.

Thorax gray, the praescutum with three dark brownish gray stripes, the median one longest, broadest in front, narrowed to the suture; scutum light gray with two darker gray blotches, the larger of which lies on the scutal lobes; scutellum light gray with a faint, reddish cast; postnotum light gray with a narrow, indistinct median brown line which is continued forwards on to the scutellum. Pleura light grayish pruinose. Halteres rather short, yellow, the knobs dark brown. Legs with the coxæ light gray pruinose; trochanters dull yellow; femora yellow, beyond the middle passing into light brown; tips broadly black, a broad, yellow subterminal annulus; this yellow femoral ring is most distinct on the fore legs, less evident on the posterior legs; tibiæ and tarsi dark brown. Wings whitish with a heavy brown pattern; dark brown blotches at the arculus, stigma, and a smaller one at the origin of the sector; four grayish brown cross-bands, the first

basal in position occupying the cubital and anal cells; the second band about mid-length of the basal cells, darkest in cells *R* and *M*, in the anal cells paler but more diffused; the third band at the cord, darkest near the stigma and along *Cu;* fourth band occupying the wing-apex, darkest in the apices of cells R_2 and R_3, caudad of these paler; base of the wing, costal and subcostal cells indistinctly tinged with yellow; veins dark brown. Venation: vein R_2 persistent for its entire length; petiole of cell M_1 shorter than this cell; cross-vein *m-cu* present, situated at about the basal third or quarter of cell *1st* M_2.

Abdominal tergites yellow with a very broad, dark brownish black dorsal stripe beginning on segment two, continuing to segment seven; this occupies most of the dorsum of all these segments being interrupted caudally by a broad, yellowish ring; lateral margins of the tergites very broadly silvery, caudal margins very narrowly of the same colour; a narrow, interrupted, dark brownish black line just inside the gray margins; segments eight and nine brown. Sternites light yellowish brown with an indistinct, pale brownish line, the apical sternites light brown. Male hypopygium enlarged; ninth tergite very large and prominent, subquadrate, the dorsum almost flat, not chitinized; caudal margin with a very deep, narrow, median split, the adjacent lobes very broad, their apices almost truncated, very narrowly chitinized. Ninth pleurite small, complete. Ninth sternite deeply and broadly split, the margins fringed with abundant long, pale hairs that are decussate across this median notch. Eighth sternite almost straight or with a very broad, V-shaped notch, on either side with a large tuft of yellow hairs that are decussate across the median line.

Habitat.—New York.

Holotype.—♂, Ithaca, Tompkins Co., New York, June 12, 1915.

This beautiful *Tipula* is very different from any species that I have ever seen, in some ways suggesting *Tipula ternaria* Loew of Northeastern North America but in reality a very different species. The yellow subterminal annulus on the femora will separate the fly from all its relatives in Eastern North America.

Tipula kirbyana, new species.

Allied to *T. whitneyi;* general colour of the head and thorax light gray; a narrow, brown or black dorso-median vitta extends the length of the thorax and abdomen; antennæ black; femora strongly incrassated; wings indistinctly marked with pale brownish clouds; abdomen reddish yellow with a brown dorso-median black stripe.

Male.—Length 10.2 mm.; wing 11.7 mm.

Palpi dark brown. Frontal prolongation of the head moderately elongated, deep chestnut-brown, above sparsely dusted with gray; nasus lacking. Antennæ dark brown, the scapal segments a little more reddish and sparsely dusted with gray; flagellar segments rather short, deeply incised, the basal swelling shorter than the pedicel of each segment. Head gray, the vertical tubercle large, prominent, with an indistinct, brown median line that becomes indistinct behind; eyes very small, widely separated.

Thorax light gray, the usual praescutal stripes not very distinct, the median one tinged with brown; scutellum more reddish with an indistinct, median brown line; postnotum gray with a brown, median line. Pleura light gray, the dorso-pleural membrane obscure yellowish. Halteres light brown, the knobs a little darker brown. Legs with the coxæ long and powerful, light gray; trochanters chestnut-brown; femora short and stout, considerably incrassated apically, reddish brown; dark brown at the tips; tibiæ dull brownish yellow, the tips darkened; tarsi dark brown, the metatarsi paler. Wings slightly crumpled, possibly the first indications of degeneracy; membrane indistinctly blotched with brownish; cells *C* and *Sc* a little more yellowish; stigma indistinct, brown; clouds of brown at the origin of *Rs*; along the cord in cell *M;* apex of cell *1st A*, etc. Venation: vein R_2 persistent but pale at its tip; cell *1st* M_2 very small and short, only a little longer than broad; fork of cell M_1 deep; cross-vein *m-cu* obliterated by the fusion of Cu_1 on M_{3+4}.

First abdominal tergite brownish basally, the remainder of the dorsum of segments 1 to 8 light reddish yellow, the segments broadly ringed with yellowish; a very conspicuous black median vitta runs the length of the abdomen, interrupted only by the yellow caudal margins to the segments; this vitta begins on segment 1 and continues to the eighth tergite;

lateral margins of the tergites broadly yellowish. Sternites reddish brown with an indistinct, narrow, brown median line; lateral portions of the sternites infuscated, caudal margins of the segments yellowish. Male hypopygium with the ninth tergite rather prominent, the caudal margin with a broad and deep, U-shaped median notch; the basal portion of the tergite is tumid, shiny chestnut but a broad margin around the notch is flattened, the extreme edge narrowly blackened, chitinized, lateral lobes truncated. Ninth pleurite complete, semicircular; outer pleural appendage elongate-cylindrical, clothed with long, golden hairs; inner pleural appendage very long and narrow, jutting into the notch of the tergite, the outer edge clothed with long, pale hairs that project backward to produce a hystriciform appearance; apex of the appendage shiny chestnut-brown. From the ventral caudal angle of the pleurite arises a shiny, chestnut-brown, flattened lobe that is directed caudad, its apex truncated. Ninth sternite with a deep, V-shaped median notch that extends a little more than half the distance to the margin of the eighth sternite. Eighth sternite unarmed.

Habitat.—Alaska.

Holotype.—♂, Point Barrow, Alaska, July 14, 1898.

This species is closely allied to *Tipula whitneyi* Alex. from the Pribilof Islands, Alaska, but is readily separated by the full-winged males and the details of the hypopygium.

NOTE ON OVIPOSITION OF GASTEROPHILUS NASALIS L.

BY CHARLES H. T. TOWNSEND, WASHINGTON, D.C.

In the November, 1892, issue of Entomological News, pages 227-8, I published some notes on this subject, in which I stated that "I noticed the fly alight several times, always exactly in the region ventrad of the first cervical vertebræ." This observation relates to a female which I captured May 15, 1892, while it was flying at the throat of my horse, near Las Cruces, New Mexico. In the same notes I quoted Brauer's statement (Mon. Oestr., page 60) that "according to Dr. Green *G. nasalis* deposits its white eggs in the region of the throat of the horse." I further stated that I had not found the eggs of the fly, though I searched the ventral region of the throat after capturing the above female.

On October 2 and 3, 1917, while in camp on the East Verde River, Arizona, at a point about eight miles north of Payson, altitude 4,400 feet, I took two females of *nasalis*, and noted others, flying at the throat of my horse, but in no case did they alight there. They were seen to hover directly under the animal's throat, and then dart suddenly at the muzzle. I saw this operation repeated many times before I was able to capture the fly, as this action of darting at the muzzle made the animal especially wild. On examination immediately thereafter, I found several whitish eggs with their sharp bases penetrating and adhering in the skin of the upper lip. These eggs were lost owing to the frantic struggles of the horse at the time, but similar eggs were dissected from the abdomen of the fly.

The egg is practically the same size and shape as that of *intestinalis* and not at all like that of *haemorrhoidalis*, but the anal end is moderately pointed though somewhat blunt as seen under a high power. It is capable, however, of penetrating tender skin, as tested on the back of my finger. Moreover, the chitinized clasping forceps at the end of the heavy ovipositor are quite sharp in *nasalis*, while they are decidedly blunt in both *intestinalis* and *haemorrhoidalis*.

On the East Verde *intestinalis* was common but caused no such alarm as did *nasalis* while ovipositing. No specimen of *haemorrhoidalis* was seen anywhere in that region.

The above facts seem to indicate that *nasalis* oviposits about the muzzle of the horse, hovering under the throat merely as a preliminary while seeking a good opportunity to dart at the lips, and piercing the tender skin with the sharpened forceps of the ovipositor while thrusting the anal end of the egg into the puncture. It seems further that this habit of darting at the muzzle of the animal was known to Linnæus, else why should he have named the species *nasalis?* It appears that in later times the preliminary action of the fly in seeking the throat has been commonly observed and its darting thence to the muzzle, overlooked by some investigators though recorded by others, hence the mistaken opinion still held by some that it oviposited in the region of the throat. It is against all reason that the eggs should be placed under the throat,

since they would be least likely to reach the mouth from such location.

It may be added that *Gasterophilus* has no incubating uterus, but that the large ovaries are packed with eggs which come down a few at a time for deposition. The eggs of the above *nasalis* female show no incubation, and the chorion is transversely corrugated so that it holds on insertion in the skin. All the records of lip and muzzle oviposition of this species that I have seen state that the eggs are attached to the hairs. This might easily happen when the fly misses its mark, and no doubt it misses frequently, but the effort is evidently directed at the tender skin of the lips. The eggs are sticky when freshly extruded, and the fly may even, at times, inadvertently leave them on the hairs of the throat when caught by the convulsive movements of the intended host. This would explain throat oviposition records.

AN ANNOTATED LIST OF THE CERAMBYCIDÆ OF CALIFORNIA.

BY RICHARD T. GARNETT, UNIVERSITY OF CALIFORNIA, BERKELEY, CAL.

(Continued from page 213.)

141. *Gaurotes cressoni* Bland.

Rare in Northern California. Several taken by Van Dyke in Marin County on flowers of the wild honeysuckle in April.

142. *Leptura obliterata* Hald.

Breeds in Douglas spruce, sapwood of redwood, and other coniferous trees. Found in the coast counties from Santa Cruz to the Oregon line.

143. *Leptura soror* LeConte.

Found throughout the Sierras at altitudes of 4,000–8,000 feet, usually on flowers of veratin. Taken by author at Donner Lake and Tahoe Tavern, breeding in branches of *Pinus ponderosa*. July 1–21.

144. *Leptura propinqua* Bland.

Found north and in the higher Sierras on various flowers. Breeds in various coniferous trees. Taken by author at Donner Lake. July 10.

145. *Leptura kerniana* Fall.
Taken by Daggett on the Kern River.

146. *Leptura plagifera* LeConte.
Taken rarely in northern Sierras. Found especially on the eastern sides of the Cascades.

147. *Leptura rubida* LeConte.
Rare. Taken in Northern California, Coast belt to San Francisco, and in Sierras—a different colour phase in each section.

148. *Leptura subargentata* Kirby.
Common at Camp Meeker, Sonoma County.
var. *ruficeps* LeConte.
Found throughout the Sierras.
var *rhodopus* LeConte.
Breeds in tan bark oak.
var. *similis* Kirby.

149. *Leptura molybdica* LeConte.
Fairly common throughout the State on various flowers. Taken by Fall at Pasadena on Ceanothus; by Van Dyke in Sierra County, and the middle and northern Sierras.

150. *Leptura læta* LeConte.
Found throughout the State; not abundant anywhere, most common in the foothills of the Sierras. Found by Van Dyke on flowers, especially those of California wild holly. Bred by Rivers from live oak. Taken by author at Donner Lake, July 12.

151. *Leptura tribalteata* LeConte.
Found in Northern California and Sierras as far south as Walker Basin. Taken by author at Donner Lake July 6 on meadow flowers.

152. *Leptura coquilletti* Fall.
Taken on flowers of *Eriogonum fasciculatum* in June by Ricksecker. Taken by Van Dyke in Sierra Madre Mts., San Bernardino Mts., and also Los Angeles County.

153. *Leptura impura* LeConte.
Taken rarely in the redwood belt of Sonoma County. One specimen taken by Van Dyke in Siskiyou County. Supposed by Blaisdell to breed in the sapwood of redwood.

154. *Leptura instabilis* Hald.
Taken in moderate numbers in parts of Northern California and in Sierras. Rare in June on Pomona foothills. Taken by Van Dyke on lupine at Tahoe; by author at Donner Lake, July 3.

155. *Leptura sexmaculata* Linne.
Northern, barely running over into this State. Breeds in spruce.

156. *Leptura barberi* Fall.
Taken in Humboldt and Shasta Counties. Breeds in the Sitka spruce. Rather rare.

157. *Leptura vexatrix* Mannerheim.
Found on umbelliferous flowers, yarrow, etc., through the Sierras from Siskiyou County south to Calaveras County. This is considered by Van Dyke as a variety of *quadrillum* Lec.

158. *Leptura sexspilota* LeConte.
Taken abundantly in Southern California by Van Dyke in May and June on flowers of greasewood; also taken near Los Angeles on wild walnut. Taken at San Pedro Martir, Lower California.

159. *Leptura matthewsii* LeConte.
Never found on flowers, but resting on leaves. Found in the Coast belt from Marin County to the northern line. Has been bred from the sapwood of the redwood. June 27.

160. *Leptura grossa* LeConte.
Rare in the Sierras, on veratrin flowers. One taken by Van Dyke on stump of *Pinus ponderosa* in Yosemite Valley.

161. *Leptura brevicornis* LeConte.
Found rarely in the north and in the Sierras. Breeds in *Pinus ponderosa*. Taken by author at Donner Lake. July 7.

162. *Leptura nigrella* Say.
No data.

163. *Leptura carbonata* LeConte.
Northern California.

164. *Leptura subcostata* Fall.
One specimen taken by Fall at Tahoe.

165. *Leptura dehiscens* LeConte.
Rare, in the Sierras; northern, one specimen taken by Van Dyke in Siskiyou County. Four taken from small limbs of *Pinus ponderosa* at Calistoga by author. May 28.

166. *Leptura sanguinea* LeConte.
Found in Northern California and throughout the Sierras on veratrin and other flowers. May 30–July 17.

167. *Leptura lætifica* LeConte.
Taken in Sierras and Northern California; common in places in Shasta Lake, and Sonoma Counties on flowers of Eriogonum, etc. May 25–June 19.

168. *Leptura pernigra* Linnell.
Taken in Sierras Madre Mts., Los Angeles County by Van Dyke.

169. *Leptura quadrillum* LeConte.
Found on yarrow, etc., in the northern part of the State.

170. *Leptura chrysocoma* Kirby.
Common in the Sierras and Northern California on veratrin, yarrow, and other flowers. Taken in large numbers at Donner Lake and Tahoe by the author in July. July 1–21.

171. *Leptura dolorosa* LeConte.
Found especially on the Ceanothus in Northern California and the Sierras; common in places.

172. *Leptura crassipes* LeConte.
Found throughout the State, common in the northern part, less common in the south. Taken by Fall in the San Bernardino Mts. Usually found on the flowers of the yarrow, ox-eyed daisy, etc. Bred from *Umbellularia californica* by Rivers and Van Dyke. Bred from *Eucalyptus globulus* by Van Dyke. Taken by author at Calistoga. May 21.

173. *Leptura behrensii* LeConte.
Rare Two specimens taken by Baumberger in Northern Sonoma Co.; type specimen from Mendocino Co.; one taken by Van Dyke in Humbolt County.

174. *Leptura scripta* LeConte.
Common on Coast belt from Marin County to northern line on flowers, especially Azalea, Rhododendron; rare in the various parts of the Sierras. June 9.

175. *Leptura gnathoides* LeConte.
Found in Sierras and Northern California. Rare. Taken in Placer County by Van Dyke on young trees of post cedar.

176. *Leptura valida* LeConte.
Found rarely from Shasta to the Southern Sierras. Breeds in pine. Taken by author at Donner Lake. July 18.

177. *Leptura insignis* Fall.
Taken by Fuchs and Fenyes at Monterey. Breeds in Monterey pine; remains also found in *Pinus muricata* at Inverness; a specimen was bred by Van Dyke from Douglas spruce branch of unknown locality.

178. *Leptura aspera* LeConte.
Northern, may possibly run over into California.

179. *Leptura cubitalis* LeConte.
This species, which looks like an Acmæops, is fairly common in the middle part of California. It is found on wild rose, etc., in Sonoma, Napa, San Mateo, and Lake Counties. June 8–29.

180. *Ophistomis ventralis* Horn.
Taken at El Taste, Lower California.

181. *Strangularia delicata* LeConte.
Occasionally found in most parts of the State, but is more common in the north and middle Sierras on various flowers. June 3.

(To be continued)

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POPULAR AND PRACTICAL ENTOMOLOGY.

The Relation of Agronomy to Entomology: A Practical Illustration.

by John J. Davis, West Lafayette, Indiana.

Numerous instances are on record where the occurrence of a noxious insect has resulted in recommendations which are not only effective in controlling the pest, but at the same time a benefit to agriculture. It is here sufficient to illustrate with such common examples as the northern corn root-worm (*Diabrotica longicornis*) and the corn root-aphis (*Aphis maidi-radicis*) which are controllable by proper rotations, and the alfalfa weevil (*Phytonomus posticus*) which is checked by the use of methods beneficial to the plant and disastrous to the insect. Recommendations for Hessian fly control may likewise be considered beneficial from the point of view of the agronomist, since it has been learned that the time of seeding to avoid the fly attack in the fall is coincident with the proper seeding date regardless of insect prevalence, and further that the supplementary recommendation, namely that of destroying the summer brood of fly by plowing under the stubble, is a good agronomic practice according to certain authorities, and especially in those sections where the fly is so frequently abundant.

In the past we have been largely dependent on two practices for the control of the common white grub (*Lachnosterna* spp.), namely that of pasturing hogs in infested fields and a rotation whereby corn, the most important field crop injured by grubs, is planted the year of grub abundance on ground which was continually cultivated during the flight of May-beetles the preceding spring. In other words, the control is practically a recommendation to plant corn on corn ground, that is, corn on ground likely to contain fewer grubs, in order to avoid injury. This can hardly be considered a remedy since it avoids rather than destroys the insect, and the practice of planting corn on corn ground is not good

agronomic advice, nor indeed is it a good entomological practice in relation to such insects as the root aphis and root worm.

For several years past our records have shown very little or no injury to corn planted on ground which was in clover the preceding year, and not infrequently observant farmers have reported this condition. The past year observations which are more conclusive and which corroborate the above statment have been made. For instance, last fall at Cascade, Iowa, we collected grubs behind a plow which circled a field, two-thirds of which bore a crop of timothy and one-third a good stand of alsike clover. As the plow turned up the soil in the timothy area the grubs were very abundant but as soon as the clover sod was reached, scarcely a grub could be found. Further, at one corner of the clover area the clover had died out, apparently because the lime had washed away, and the small patch had grown up in smartweed, sorrel and the like, and here the grubs were again abundant as in the timothy end of the field. At Richland, Michigan, a farmer limed his field preparatory to sowing clover, but left one drill row unlimed to satisfy himself on the value of the lime. Last spring when the May-beetles were abundant at Richland there was an excellent stand of red clover over the entire field excepting the unlimed strip which grew up to grass and timothy. An examination this spring revealed 30 to 40 grubs to the square yard in the unlimed strip, that is, where the timothy was growing, while in the rest of the field where the clover had made a good growth only 1 or 2 grubs to the square yard were to be found, and in digging a trench from the clover into the timothy one knew as soon as the timothy strip was reached by an abundance of grubs. All of these facts give us conclusive evidence that May-beetles will not deposit their eggs in numbers in ground which has a stand of clover which covers the ground, probably because the clover mats over the surface and makes it difficult for the beetles to make an entrance.

The natural conclusion is to substitute clover for timothy in the rotation and to follow corn on clover ground, especially the year following an abundance of May-beetles. The growing of clover in place of timothy is a practice which has been recommended and advised by agronomists, but in most sections where

the grubs are destructive the advice has not been followed. Farmers, as a rule, tell us they cannot grow clover in northern Illinois, southern Wisconsin and similar latitudes because of winter killing. On the contrary thoroughly competent authorities inform us that if the land is properly prepared for clover the danger of loss by winter killing is of little consequence, and that agriculture would be greatly improved in these sections if it were possible to secure a greater acreage of clover to replace the now large acreage of timothy. With the knowledge we now possess with regard to the importance of clover in the rotation as a means of preventing white grub injury it is not unlikely that it will have some influence in reducing the timothy and increasing the clover acreage in the white grub districts, and in this way in part compensates for the losses which have resulted within the past ten years.

A rotation which we have recommended in the past for the white grub territory of northern Illinois and southern Wisconsin and similar latitudes and which is approved by the agronomists is oats or barley, clover and corn. If oats or barley are on the ground the year of the May-beetle flight it will contain many grubs but since either will be followed by clover which is little injured by white grubs, no harmful results will follow. If the field bears a good stand of clover during May and June of the year May-beetles are abundant, few or no eggs will be laid in the ground and it can be safely followed by corn, while if the field is in corn the year the beetles are abundant, few eggs will be laid if the field is kept cultivated during the flight of the May-beetles, as it naturally should be, and further even should there be eggs laid in the corn ground as there occasionally are when the field is alongside a timber lot, the ground would be planted to oats or barley the following year according to the rotation suggested and these grains are little injured by grubs.

These few facts regarding the role of clover in the rotation to prevent white grub losses are brought together not only to emphasize the entomological importance of this crop, but also to show again the intimate relation between the study of soils and crops and field crop entomology, and the importance of a more intimate correlation of the two subjects.

NEW SPECIES OF ODONATA FROM THE SOUTH-WESTERN UNITED STATES.

Part I. Three New Argias.

BY CLARENCE HAMILTON KENNEDY, CORNELL UNIVERSITY, ITHACA, N.Y.

The following new species of Argia have been in the writer's hands for three years awaiting such time as he might have to describe them. The specimens from the Museum of Comparative Zoology labelled *solita* were called to my attention by Dr. Calvert. I wish to thank Dr. Calvert and Dr. Banks for the privilege of describing these. After I had taken *hinei* at Fillmore, Calif., I found that Dr. Hine had taken it in Arizona and his material was in Mr. Williamson's hands awaiting description. I wish to thank Mr. Williamson for the privilege of describing these.

Argia solita, n. sp.

Holotype.—Male in the Museum of Comparative Zoology, Cambridge, Mass., with the pin labels; "Arizona, C. U. Lot 35;" and "A. solita." The Cornell catalogue shows that this was purchased from H. K. Morrison in 1883, when it was probably sent to Hagen for identification.

A study of the penes shows this to be a near relative of *Argia agrioides*. Among my material of *agrioides* from California are specimens from Chico which have unforked humeral stripes and which in drying have turned partially violet, so this may be a badly faded, pale variety of *agrioides*.

Length of abdomen 26 mm., length of hind wing 22 mm.

Colour: labium creamy; entire face and head otherwise violet, except rear of head which is pale (creamy?). Eyes?

Prothorax violet with a small black spot on the side. Mesothorax and metathorax violet, shading to creamy below with a mid-dorsal black stripe one-sixth as wide as either mesepisternum. Humeral stripe a hair line and a similar black line on second lateral suture. Legs and feet pale with a narrow, external black stripe on the femur. Wings hyaline, pterostigma mounting but one cell and brown in colour.

Abdomen violet. Segments 1 and 2 without distinct markings except a lateral spot at apex of seg. 1 and a narrow, black ring around apex of seg. 2. Segs. 3–6 each with a narrow, black

apical ring and a lateral apical spot of irregular outline which is one-fourth as long as the segment. Seg. 7 with an interrupted, irregular stripe along the side, below the apical end of which is a small detached spot. No apical ring on seg. 7. Segs. 8–10 blue? —some irregular, obscure dark areas along lower side of seg. 8, which may represent a black lateral stripe in better preserved material.

Dorsal appendages short with a large ventral hook on the internal angle. Inferior appendage, bilobed, the lobes triangular and subequal; the posterior lobe directed caudad, the dorsal lobe directed dorsad, bearing on its apex an ill-defined spur directed dorsad. Inferior appendages as long as seg. 10 and twice the length of the superior appendages.

Female unknown.

Argia alberta, n. sp.

Holotype.—Male, collected by the writer in the Owen's Valley, at Laws, California, August, 1915, and now in the U. S. National Museum.

Paratype.—Female, collected by the writer in the Owen's Valley, at Laws, California, August 17, 1915, and now in the U. S. National Museum.

This species simulates *Argia sedula* in colour and appendages, but the penes show this to be more nearly related to the northern *violacea* group, while *sedula* is nearer *translata* and a large series of Mexican species.

I take pleasure in naming it after my father Albert Hamilton Kennedy.

Male, length of abdomen 22 mm., hind wing 18 mm.; female, abdomen 22 mm., hind wing 18 mm.;

Male.—Colour: Labrum pale blue, the remainder of the face and head blue with an olive or, in some dried material, a violet cast. Under surface of head yellowish gray with a small black spot on each side of the occipital foramen. Clypeus edged with black. A wide bar through the paired ocelli and a broad, black stripe behind each postocular area. Eyes dark blue, paler below.

Prothorax black dorsally with a bluish spot on each side. Mesothorax and metathorax dull blue (violet or brown in dried material) darker and duller on the dorsal surface and grayish on

the sides. Mid-dorsal stripe occupying one-third of the area between the humeral sutures. Humeral stripe half as wide as the mid-dorsal, its upper third forked. A black line on second lateral suture 1 mm. wide.

Pterostigmata brown subtended by one cell. Legs pale with blue on base of femora, broadly marked with black on the dorsal and anterior surfaces of the femora and on the anterior and internal surfaces of the tibiæ. Tarsi black.

Abdomen with segs. 1–3 dull blue becoming duller or brownish on the lower sides. Seg. 1 with a baso-dorsal black spot. Seg. 2 with a narrow apical band and a lateral stripe black. Seg. 3 with the apical third and a lateral stripe black. Segs. 4–7 with the apical third and the dorsum black except a narrow basal band blue, the sides bluish or brownish. Segs. 8–10 pure, pale blue the lower edges more or less blotched with black.

Superior appendages twice as long as wide when viewed from above, slenderer in profile. A prominent, internal, apical hook directed ventrad. Inferior appendages bifid, the lower ramus round or bluntly triangular directed caudad, superior lobe directed dorsad and terminating in an acute point.

Female.—Colour as in the male but with the blue of the head and thorax paler. Eyes gray bluish above. Humeral stripe but half as wide as in the male, its branches linear. Legs marked as in male but the black on the femora reduced somewhat. Abdomen brown with a narrow apical band on segs. 2–6. Segs. 2–6 with an apical dorsal spot, a lateral stripe and an oblique spot on the lower apical angle of the side. Seg. 7 with dorsal half black except a narrow band across the base. Segs. 8–9 with dorso-lateral stripe. Seg. 10 pale. In some females seg. 6 is coloured like 7.

Mesostigmal laminæ with no special modifications.

A single male of this is in the Snow Collection from Colorado Springs, Colo., collected by E. S. Tucker. A male and female from Provo, Utah, are in the collection of Dr. Ris.

Argia hinei, n. sp.

Holotype.—Male, collected by the writer at Fillmore, Ventura Co., Calif., Aug. 7, 1915, and now in the collection of Mr. Williamson.

Paratype.—Female, collected by the writer at Fillmore, Ventura Co., Calif., Aug. 7, 1915, and now in the collection of Mr. Williamson.

Other material examined included thirteen males and a second female from Fillmore, Calif., and five males from Santa Barbara, Calif., all of which were of the dark typical coloration. A series of specimens from Arizona with less black were as follows: A male in Dr. Calvert's collection labelled "A. solita" by Hagen and which had been associated in the M. C. Z. collection with the type of *solita*. See figs. 17–22. Seven males and a female from the Huachuca Mts., Arizona, collected by Dr. Hine, July 28–29, 1907, and now in Mr. Williamson's collection. A single male from the Santa Rita Mts., Arizona, in the Snow Collection, Kansas University, collected by Dr. F. H. Snow, in June, at an elevation of 8,000 feet.

I take pleasure in naming this after Dr. Hine, a suggestion made by Mr. Williamson.

Male abdomen length 26–27 mm., hind wing 20 mm.; female abdomen 26 mm., hind wing 21 mm.

Male.—Colour: Labium and rear of head pale; labrum, face and top of head violet. A black bar through the ocelli; postocular areas edged posteriorly with black. Eyes violet in life.

Prothorax violet with a mid-dorsal stripe and a lateral stripe black.

Mesothorax and metathorax violet with mid-dorsal keel edged with pale; the mid-dorsal stripe slightly wider than either pale stripe bordering it. Humeral stripe one-third as wide as the mesepimeron, forked in its upper third. Second lateral suture narrowly black. Pterostigmata subtended by one cell, brown. Legs pale with a heavy black stripe on the upper and anterior surfaces of femur, and an internal black stripe on the tibia.

Abdomen with segs. 1–7 violet, segs 8–10 blue with the following black markings: a dorso-basal spot on seg. 1, narrow apical rings on segs. 2–7. Seg. 2 with a lateral stripe not reaching the apical edge. Segs. 3–5 with a spot covering apical fourth of the side, the pairs on segs. 4–6 confluent on the middorsal line. A small antero-lateral spot on seg. 6. Seg. 7 with the dorsal half black except a narrow basal band; and having a small latero-

apical spot in the ventro-apical angle of the segment. Segs. 8 and 9 with more or less black on the lower sides.

Some males show antero-lateral spots on segs. 4–6.

The specimens from Arizona have less black on the head and thorax. In Dr. Calvert's specimen the humeral stripe shows no trace of a fork. In the male from the Santa Rita Mts. the humeral stripe is forked and almost as heavy as in the Fillmore and Santa Barbara specimens. The specimens from the Huachuca Mts. have humeral stripes from the narrow form in the Dr. Calvert male to those in which a fork is suggested by a more or less perfect branch, but in all cases narrow.

Appendages: superior appendage cupped on the ventral surface, with a tooth on the ental edge, which turns under the appendage thus being directed ectad; and a blunt, black subapical ventral tubercle. Inferior appendage bifid, the lower lobe rounded or triangular, the upper directed caudad and bearing a small tooth on its upper edge.

Female coloured brown with the black markings on the head and thorax as in the male. Eyes in life brownish violet. The abdomen with lateral stripes on segs. 2–9, those on segs. 7 and 8 more or less confluent with their mates along the mid-dorsal line. Segs. 2–8 with a latero-apical oblique spot on the lower apical angle of the side. Segs. 2–7 with a narrow apical ring.

The female mesostigmal laminæ have each a small posterior, free lobe.

EXPLANATION OF PLATE V.

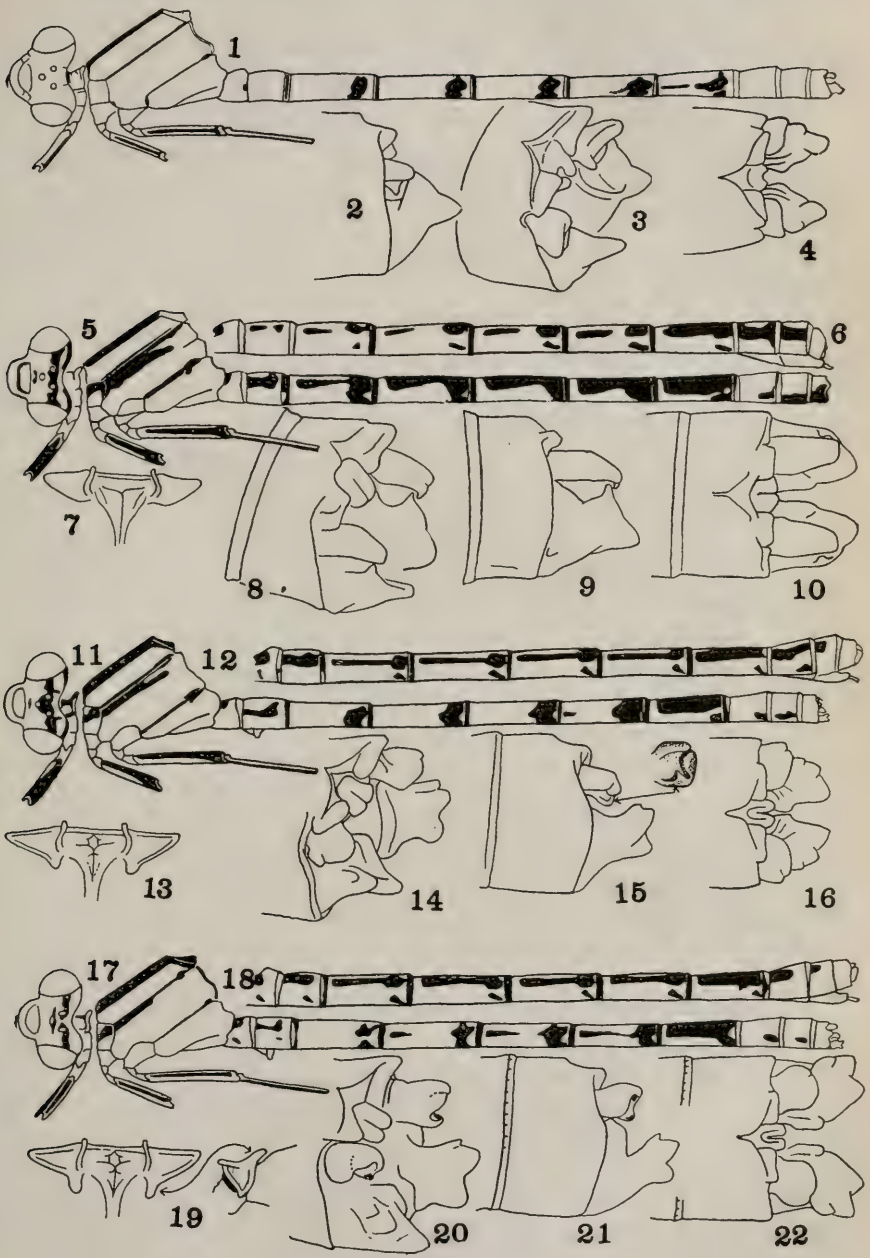
Figs. 1–4. Holotype of *Argia solita*. Fig. 1 colour pattern, figs. 2–4 appendages.

Figs. 5–10. Types of *Argia alberta*. Fig. 5 colour pattern of male, fig. 6 of abdomen of female; fig. 7 mesostigmal lamina of female. Figs. 8–10 male appendages.

Figs. 11–16. Types of *Argia hinei*. Fig. 11 colour pattern of male, fig. 12 of abdomen of female; fig. 13 mesostigmal lamina of female. Figs. 14–16 appendages of male.

Figs. 17–22. Pale *Argia hinei* from Arizona. Figs. 17, 20–22 the male labeled *solita* by Hagen and now in Dr. Calvert's coll.

Figs. 18–19. Female from the Huachuca Mts.



THREE NEW ARGIAS.

See p. 260.

THE HEATH COLLECTION OF LEPIDOPTERA.

BY J. B. WALLIS, WINNIPEG, MAN.

(Continued from Vol. XLIX, page 229.)

Limacodidæ.

4445 *Tortricidia testacea* Pack.

Thyridæ.

4471 *Thyris lugubris* Bdv.

Cossidæ.

4482 *Cossus* (*Acossus*) *centerensis* Lint.
4483 " " *populi* Walk.
4487 *Prionoxystus robiniæ* Peck.

Sesiidæ.

4523 *Bembecia marginata* Harr.

Many of the "Micros" had been identified by Mr. Kearfott. Unfortunately the names had been taken off the specimens and placed behind series often containing several species. Some of these were identified by comparison with specimens in my collection, identified by Mr. Kearfott. The remainder were sent to Mr. Busck who kindly went over them.

Pyralidæ.

4640 *Desmia funeralis* Hbn.
4703 *Evergestis straminalis* Hbn.
4709 *Nomophila noctuella* Schiff.
4714 *Loxostege chortalis* Grt.
4725 " *sticticalis* Linn.
4726 " *commixtalis* Wlk.
4748 *Diosemia plumbosignalis* Fern.
4769 *Peripasta cæculalis* Zell.
4770 *Phlyctænia ferrugalis* Hbn.
4773 " *itysalis* Wlk.
4779 " *terrealis* Tr.
4782 " *tertialis* Gn.
4789 *Pyrausta thestealis* Wlk.
4792 " *oxydalis* Gn. Probably.

4805 *Pyrausta fumalis* Gn.
4811 " *fumoferalis* Hulst.
4812 " *unifascialis* Pack.
4814 " *fodinalis* Led.
4816 " *perrubralis* Pack.
" *ochosalis* Dyar.
4824 " *generosa* G. & R.
4837 " *nicalis* Grt.
4842 " *funebris* Strom.
4858 *Nymphula icciusalis* Wlk.
4863 " *badiusalis* Wlk.
4866 " *maculalis* Clem.
4881 *Scoparia centuriella* Schiff.
4888 *Pyralis farinalis* Linn.
4895 *Herculia himonialis* Zell. This, according to Drs. Barnes & McDunnough is an abberation of *olinalis* Gn.
4913 *Schœnobius unipunctellus* Rob.
4916 " *tripunctellus* Rob.
4917 " *mellinellus* Clem.
4917b " *albicostellus* Fern.
4918 " *clemensellus* Rob.
4936 *Crambus pascuellus* Linn.
4939 " *unistriatellus* Pack.
4940 " *præfectellus* Zinck.
4953 " *perlellus* Scop. (*innotatellus* Wlk:)
4958 " *vulgivagellus* Clem.
4960 " *ruricolellus* Zell.
" *dorsipunctellus* Kearf.
4974 " *mutabilis* Clem.
4977 " *trisectus* Wlk.
4980 " *caliginosellus* Clem.
4982 " *luteolellus* Clem.
Thaumotopsis fernaldellus Kearf.
4995 *Argyria auratella* Clem.
5000 *Diatræa idalis* Fern.
5004 *Chilo comptulatalis* Hulst.
5079 *Mineola tricolorella* Grt.
5108 *Ambesa lætella* Grt.

5110 *Ambesa niviella* Hulst.
5127 *Meroptera pravella* Grt.
5150 *Salebria basilaris* Zell.
5155 " *purpurella* Hulst. (*Myrlæa delassalis* Hulst.)
5159 *Laodamia fusca* Haw.
5175 *Epischnia albiplagiatella* Pack.
5176 " *boisduvaliella* Gn.
5185 *Megasis atrella* Hulst.
5189 *Lipographis leoninella* Pack.
5232 *Hulstia undulatella* Clem.
5258 *Homœosoma uncanale* Hulst.
5270 *Moodna ostrinella* Clem.
5300 *Peoria approximella* Wlk.

Pterophoridæ.

5326 *Platyptilia cosmodactyla* Hbn. In the collection as *punctidactyla* Haw., which is a synonym.
Platyptilia pallidactyla Haw.
5351 *Pterophorus homodactylus* Wlk.
5352 " *brucei* Fern.
5370 " *monodactylus* Linn.

Tortricidæ.

5424 *Exartema fasciatanum* Clem.
5427 " *inornatanum* Clem.
5434 *Olethreutes* (*Argyroploce*) *nimbatana* Clem.
5436 " " *capreana* Hbn.
5437 " " *dimidiana* Sodoff.
5444 " " *hemidesma* Zell.
5452 " " *duplex* Wlsm.
5453 " " *nubilana* Clem.
5460 " " *constellatana* Zell.
5467 " " *instrutana* Clem.
5469 " " *campestrana* Zell.
5474 " " *bipartiana* Clem.
5489 *Eucosma morrisoni* Wlsm.
5493 " *ridingsana* Rob.
5496 " *circulana* Hbn.
5503 " *agricolana* Wlsm.

5528 *Eucosma culminana* Wlsm.
5532 " *juncticiliana* Wlsm.
" *confluana* Kearf. A form of *dorsisignatana* Clem.
" *heathiana* Kearf.
" *pallidicostana* Wals.
" *annetteana* Kearf.
" *imbrifiana* Dyar. Probably.
" *costastrigalana* Kearf.
" *bilineana* Kearf.
" *tenuiana* Wals.
" *awemeana* Kearf.
" *umbrastriana* Kearf.
5552 " *illotana* Wlsm.
5559 " *dorsisignatana* Clem.
5573 *Cydia radiatana* Wlsm.
" *dorsiatomana* Kearf.
" *pseudotsugana* Kearf.
" *triangulana* Kearf.
5633 *Epinotia fasciolana* Clem.
5654 *Ancylis mediofasciana* Tr.
5655 " *nubeculana* Clem.
5663 " *burgessiana* Zell.
5718 *Acleris subnivana* Wlk.
5722 " *nigrolinea* Rob. Probably.
5726 " *hastiana* Linn.
5740 " *cervinana* Fern.
5752 *Cenopis reticulatana* Clem.
5756 " *groteana* Fern.
Sparganothis idæusalis Wlk.
5765 *Sparganothis puritana* Rob.
5766 " *xanthoides* Wlk.
5767 " *irrorea* Rob.
" *vocaridorsana* Kearf.
5773 *Archips rosaceana* Harr.
5774 " *purpurana* Clem.
5777 " *cerasivorana* Fitch.
5796 " *persicana* Fitch.
5804 *Platynota sentana* Clem.

Pandemis canadana Kearf.
5811 *Tortrix alleniana* Fern.
5816 " *quercifoliana* Fitch.
5826 " *conflictana* Wlk.
5827 " *osseana* Scop.
" *clemensiana* Fern.
5829 " *argentana* Clerck.
5840 *Eulia triferana* Wlk.
5851 *Phalonia vitellinana* Zell.
5892 *Hysterosia inopiana* Haw.
" *cartwrightiana* Kearf.
" *merrickana* Kearf.

Yponomeutidæ.

6033 *Harpipteryx canariella* Wlsm.
6034 " *dentiferella* Wlsm.
6035 " *frustella* Wlsm.

Gelechiidæ.

6164 *Gnorimoschema gallæsolidaginis* Riley.
6226 *Gelechia lugubrella* Fab.
6254 " *ornatifimbriella* Clem.
6262 " *pseudoacaciella* Cham.
6335 *Trichotaphe flavocostella* Clem.
6344 " *setosella* Clem.

Xylorictidæ.

6380 *Stenoma algidella* Wlk.

Œcophoridæ.

6402 *Depressaria arnicella* Wlsm. Probably.
6403 " *argillacea* Wlsm.
6404 " *sanguinella* Busck.
6409 " *novimundi* Wlsm.
6412 " *ciniflonella* Zell. Probably.
6421 " *canadensis* Busck. Probably.
" *juliella* Busck.
" (*Agnopteryx*) *flavicomella* Engel.
" " *walsinghamiella* Busck. According to the new list a synonym of *fernaldella* Wlsm.

6436 *Semioscopsis packardella* Clem.
6438 " *aurorella* Dyar.
6439 " *megamicrella* Dyar.
6440 " *inornata* Wlsm.
6443 *Ethmia fuscipedella* Wlsm.

Elachistidæ.

Mompha claudiella Kearf.

Tineidæ.

7024 *Tineola bisselliella* Hum. Probably.
7026 *Monopis biflavimaculella* Clem.
7030 " *monachella* Hbn.

Hepialidæ.

7150 *Sthenopis argenteomaculatus* Harr. Probably.
7151 " *quadriguttatus* Grt. Probably. A study of our Manitoban forms of *Sthenopis* is desirable.

ECOLOGICAL NOTES ON THE SPRING CANKER WORM (*PALEACRITA VERNATA*, PECK).

BY B. P. YOUNG, CORNELL UNIVERSITY, ITHACA, N.Y.

During the past few years the elm trees of Lawrence, like those of many other Kansas municipalities have suffered materially from infestations by the spring canker worm, *Paleacrita vernata*, Peck. In fact, the large increase in numbers of this insect during the spring of 1916 seemed to foretell the impending danger of a worse devastation the next season and brought about a co-operative move on the part of the citizens to control the pest. Early in February, 1917, the city commissioners banded all elm trees, and other trees adjacent, as well as poles, with tar paper and tanglefoot, both in yards and on terraces in front. The cost of this work, combined with that of keeping the tanglefoot sticky during the season of emergence, was charged to the various taxpayers concerned.

Realizing the advantages of such conditions for an ecological study of the pest, the writer, while associated with the Department of Entomology of the University of Kansas, chose a district in which the trees had been completely defoliated the previous year and carried on the experiment outlined below.

The initial objects of the experiment were (1) the determination of the minimum temperature at which adults would emerge from the ground; (2) the average number of eggs laid by each female; (3) the incubation period; (4) the lowest temperature at which eggs would hatch, and (5) the percentage of sterility among eggs. Incidentally other interesting results were obtained.

On February 27th and on each of the twenty-five succeeding days which were warm enough to permit the emergence of adults from the ground, 100 female moths were collected from the trunks of a certain group of eight trees, either from the free portion below the bands or from the cotton beneath the bands. On two days, the 4th and 5th of March, the temperature became prohibitive to the emergence of the females, and on the 6th of the same month two separate increments were taken as a check upon each other, thus basing the results of the experiment upon the activities of 2,500 females.

Each increment of 100 females was taken to the insectary and placed immediately in a wide-mouthed, four-ounce bottle, containing a loose roll of cheesecloth. The mouth was then covered with the same material and the bottle kept under ordinary inside conditions of temperature, humidity, etc.

On each succeeding day, including the fourth, the eggs were scraped from the cheesecloth roll and weighed on a balance, accurate to milligrams. These eggs were then placed in separate vials, plugged with cotton, and placed outside a west window of the insectary office in a window box. All eggs deposited after the fourth day of confinement up to the time of death of all females were weighed together and placed in the fifth vial of a series of five.

In order to determine the average number of eggs to the milligram two large masses of eggs, especially free from foreign particles, were counted. Knowing the weight in milligrams and the total number of eggs in each, the desired average was readily computed. These two counts gave results so nearly identical that it was decided that the consideration of other masses was unnecessary, and an average of the results obtained in these two cases was used throughout the experiment.

Vials containing eggs were examined from day to day and

Increments of 100 ♀♀ — Milligrams of eggs deposited by 100 *Paleacrita vernata* ♀♀ during night of —

	II-27	II-28	III-1	III-2	III-3	III-4	III-5	III-6	III-7	III-8	III-9	III-10	III-11	III-12	III-13	III-14	III-15	III-16	III-17	III-18	III-19	III-20	III-21	III-22	III-23	III-24	III-25	III-26	III-27	III-28	Total-Mgs.	Days ♀♀ were kept
A	373	211	61	22	30																										697	12
B		302	230	59	29	18																										638	10
C			252	232	118	27	45																									674	9
D				312	394	93	62	22																								883	9
E					91	279	230	100	62																							762	10
F								227	393	175	57	12																			864	7
G								230	382	143	50	28																			833	7
H									189	425	104	42	55																		815	8
I										214	372	152	53	65																	856	10
J											273	235	43	22	42																615	10
K												260	198	74	70	81															683	9
L													110	477	148	43	38														816	10
M														189	263	58	22	33													565	9
N															365	232	24	22	39												682	9
O																330	272	80	40	33											755	8
P																	158	141	183	63	70										615	8
Q																		122	200	170	62	51									605	7
R																			155	250	153	92	62								712	9
S																				150	140	159	56	42							597	10
T																					282	215	74	30	18						619	9
U																						330	270	103	63	62					828	9
V																							163	320	103	46	45				677	8
W																								311	220	115	66	52			784	11
X																									217	180	101	42	41		587	12
Y																										218	188	42	50	21	519	11

Grand total of eggs deposited by 2500 ♀♀ - 17,681 mgs.

Average number of days ♀♀ were kept before all were dead - 9+

Fig. 10—Data

were recorded as hatching when at least twenty-five larvæ had emerged. Oftentimes one or two larvæ would appear in a vial several days before the majority of the eggs were ready to hatch.

For the determination of the percentage of sterility in the eggs, those oviposited by ten different increments of 100 females were used, giving in all 50 vials of eggs. The number of eggs failing to hatch when compared with the total number of eggs in a vial gave the percentages of sterile and fertile eggs therein.

Furthermore, 25 females were taken from the sticky bands to see what effect the tanglefoot on the body of the insect would have upon the number of eggs deposited.

Observations upon the number of males and females emerging from a very limited area were ascertained by placing a light-tight box over this surface and counting those coming up within. By placing a shell vial in a cornucopia-shaped piece of cardboard in the side of the box the adults emerging would seek the light of the vial and could be counted from day to day. Unfortunately, the possibilities of this phase of the experiment presented themselves too late for the collection of sufficient data upon which to base definite conclusions. It would be interesting to learn whether the relative proportion of males to females differs materially during the season of emergence.

Average indoor temperatures were secured from a self-recording thermometer by averaging the twelve hourly readings during the day and night, respectively.

Outdoor mean day and night temperatures were computed from the daily readings taken by the physics department at 7 a.m., 2 p.m., and 7 p.m. The mean night temperature was assumed to be the average of the readings of the thermometer at 7 p.m. and 7 a.m. The mean day temperature, however, was not so easily obtained, but by giving the 2 p.m. reading double significance, as this was probably the highest daily temperature reading, and using this reading with those at 7 a.m. and 7 p.m. a fair average was secured. Thus, in order to compute the mean day temperature on March 25, '17, which showed the following readings: 7 a.m., 43°; 2 p.m., 69.5°; and 7 p.m., 64°, we would add 43,69.5, 69.5, and 64 and divide by four, getting 61.5°.

Fig. 10 is primarily a data sheet. Here the letters of the alphabet are used to designate the several increments of 100 females collected. The groups of figures extending diagonally across the plate represents milligrams of eggs deposited on successive nights from February 27th until March 24th, inclusive. The first four figures of each horizontal row indicate the deposits of a single increment during the first four nights in the insectary; the fifth, all after the fourth night until the entire increment of 100 females was dead. The last vertical column represents, in days, the length of time each increment was kept; the column next to this the total number of milligrams of eggs deposited by each increment. A grand total of the eggs deposited by the 2,500 females appears below as well as the average number of days the insects were kept before all were dead.

The number of eggs to the milligram was computed by counts made of the eggs deposited by increments *O* and *R* on the nights of March 14th and 18th, respectively, these masses being exceptionally free from foreign particles. The count on the former, weighing 330 milligrams was 3,851 or 11.67 eggs to the milligram; that on the latter, weighing 250 milligrams, was 2,930 or 11.72 eggs to the milligram. These results were considered close enough to warrant the adoption of 11.7 to be used as a multiplier in changing milligrams to number of eggs.

Table III shows the number of eggs considered in computing the incubation period for different parts of the season, together with the total number of eggs upon which was based the determination of the average number of days spent in the egg stage.

Table IV gives the data upon which the calculation of the average percentage of fertility of the eggs depends. In each case the letter in the first vertical column specifies the particular increment whose total number of eggs deposited during each successive night is designated and totalled; whose sterile eggs deposited during each successive night is recorded and totalled; and the computed percentage of sterile eggs for each night's deposit appears with its average. At the bottom of the table appear grand totals which show an almost identical percentage of sterility in the first two nights' deposits with an increase thereafter approximating a geometrical ratio.

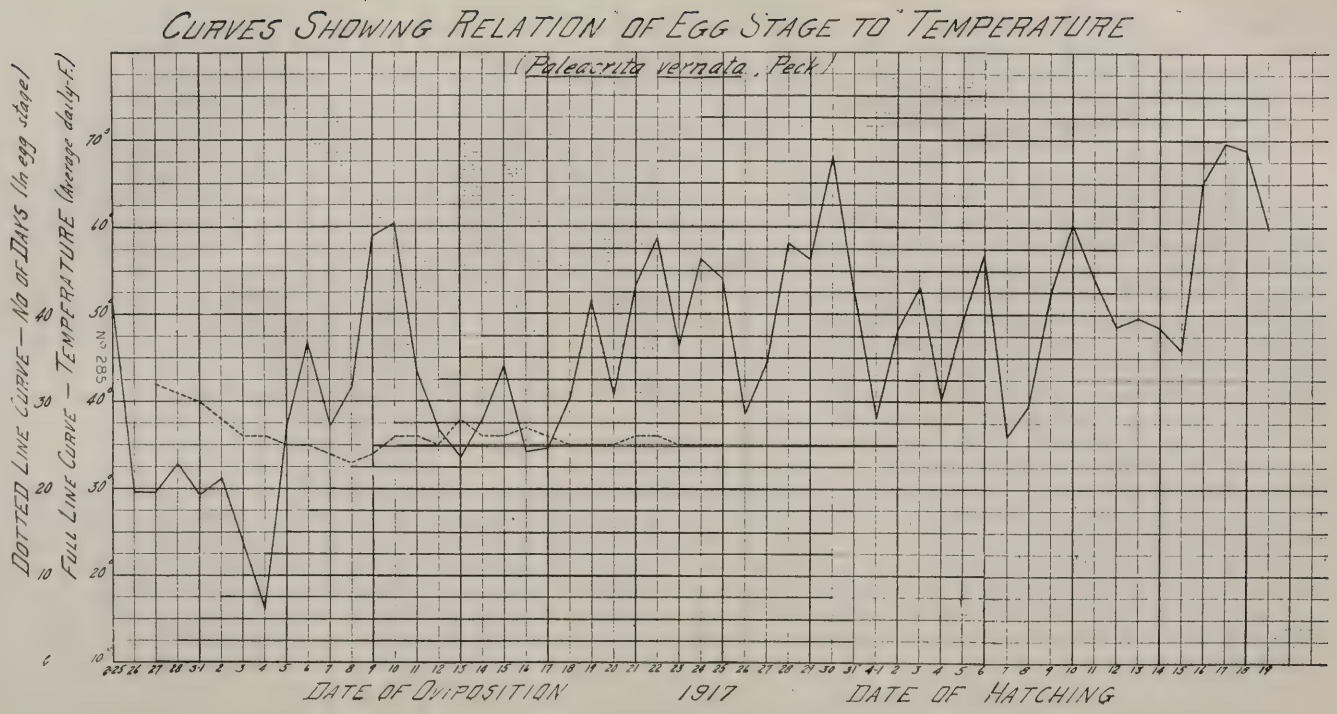

CURVES SHOWING RELATION OF EGG STAGE TO TEMPERATURE
(Paleacrita vernata, Peck)
DOTTED LINE CURVE — NO OF DAYS (In egg stage)
FULL LINE CURVE — TEMPERATURE (Average daily F.)
No. 285
70°
60°
50°
40°
30°
20°
10°
40
30
20
10
0
DATE OF OVIPOSITION
1917
DATE OF HATCHING

Fig. 11

The relation of the duration of the egg stage to outdoor temperatures is shown graphically in Fig. 11. The full line temperature date curve was plotted by using the average daily outdoor temperatures as ordinates and the dates as abscissæ; the broken line egg-stage-date of oviposition curve, by using the incubation period as ordinates and dates of oviposition as abscissæ. On the same plate the parallel transverse lines represent the incubation periods of eggs laid at different times during the season; the left end indicating the date of oviposition and the right that of hatching.

Passing now to the consideration of results it seems best to discuss first the reasonably definite conclusions and later those which might be termed suggestive.

The females began to oviposit during the second night after emergence from the ground, if we assume that most of the moths collected each day emerged the evening of the preceding day. Or, in other words, they began to oviposit during the first night in captivity. The relative percentages of eggs laid during each day following collection are: 1st, 32.93%; 2nd, 38.4%; 3rd, 15.64%; 4th, 7%; during remaining period of life, 6.03%. It is interesting to note that 71.33% of all eggs deposited appeared during the first two nights after the moths were collected.

The average number of eggs deposited by each female under the conditions of the experiment was surprisingly low. The 17,681 milligrams of eggs deposited by 2,500 females means only an average of 82.7 eggs apiece, which when contrasted with figures running as high as 400 given by dissections as well as by standard texts, seems hard to account for. In all probability the females of this species, like those of many others among insects, normally fail to deposit all the eggs of which they are capable or possibly some sterile females die before leaving a single mass of eggs.

Turning to the figures on the percentage of sterility of eggs we find the following averages for all laid during the various nights in captivity: 1st, 10.8%; 2nd, 11.2%; 3rd, 22.4%; 4th, 46.7%; and thereafter, 82.8%, with a general average of 19.15% sterility. Therefore, if the average females lay 82.7 eggs and 19.15% of these are sterile we can say, disregarding all other casualty factors,

that each emerging female will ordinarily start sixty-eight larvæ on their perilous life cycles.

The longest incubation period for any egg mass was found to be 32 days, the shortest 23, with an average of 26 days. Undoubtedly, as is to be expected, temperature plays an important role in the determination of this period, for eggs exposed to the sun, on account of a crack in the window box, under the identical conditions of others in other respects, hatched at least two or three days before those better protected from its rays.

The average number of days the females lived after being taken was about nine, although individuals varied widely in this respect.

Considering now some of the suggestive results we find good reasons for believing that the temperature prohibitive to the emergence of females is between 20 and 25° F. During the first four days of the experiment the average daily temperature remained steadily below freezing, about 30° F., and females were found in abundance, but during the fifth night the temperature dropped to 18° and as a result it was impossible to secure the moths either the next day or the following, which was preceded by a night even colder, but on the third day thereafter, following a decided rise in temperature during the previous day and night, plenty of moths were taken. The temperature of the fifth night was assumed to be that critical to the emergence of the females.

A study of Plate II shows no eggs hatching on April 1st, 4th, 7th, 8th and 15th at temperatures of 38, 40, 36, 39½ and 46 degrees respectively, but on the other hand on April 2nd, 5th, 12th, 13th and 14th they are shown to have hatched at temperatures as low as 48½, 50, 49, 49½ and 48½ degrees. Based upon the above figures an average daily temperature around 45° F. might be considered as that fatal to the hatching of eggs in the ordinary run of weather.

The count made upon the males and females emerging under a single light-tight box, 17 x 25½ inches in area, showed 34 males and 11 females, or approximately 75% of the whole number were of the winged sex.

On March 20th aside from the usual 100 normal females, 25 were taken from the tanglefoot bands, each having a certain amount

of this sticky material on its abdomen. Comparing the 33 milligrams of eggs laid by the latter 25 females with 828 milligrams by the above-mentioned 100 females, we find that in case a moth is able to drag herself through the sticky band and go on up the tree she is not likely to deposit more than 16% as many eggs as she would otherwise have done under normal conditions. The conclusion to be drawn is that even those bands which do not keep the moths away from the lower branches are somewhat effective.

It was found by isolating individuals that eggs are not all deposited at one time but may be laid in at least four different masses. Almost always sterile eggs appeared bunched together, as if from one female and not a few here and there, mixed with fertile ones.

In conclusion, we might add one more suggestion gathered from the data on the fertility of eggs, Table IV. It would seem from the consideration of the uniformity which the grand total of the number of sterile eggs indicates for each succeeding night, when compared with the pronounced dropping off in the total number of eggs laid after the second night, that the sterile females retain their eggs as long as possible, while most of the fertile females oviposit during the first or second nights after emergence.

Results of similar experiments in other localities would be interesting for comparison.

TABLE I.

MEAN TEMPERATURES (FAHRENHEIT DEGREES).
INSECTARY OFFICE. 1917.

Date	Day	Night	Date	Day	Night
February 27	82.0	80.0	March 18	70.0	62.5
" 28	79.0	80.0	" 19	77.5	82.0
March 1	81.0	76.0	" 20	85.25	81.0
" 2	77.0	78.0	" 21	79.0	79.5
" 3	80.5	76.67	" 22	83.5	84.0
" 4	64.0	71.0	" 23	78.5	74.25
" 5	72.0	76.0	" 24	73.25	76.75
" 6	83.0	69.5	" 25	73.5	69.0
" 7	73.5	75.5	" 26	69.0	67.0
" 8	82.0	83.0	" 27	72.5	74.5
" 9	84.5	83.5	" 28	76.5	87.5
" 10	81.0	86.5	" 29	86.5	83.0
" 11	70.5	62.0	" 30	82.25	83.17
" 12	75.0	77.0	" 31	80.25	80.5
" 13	75.0	73.33	April 1	70.0	71.0
" 14	80.33	81.33	" 2	70.0	72.83
" 15	81.5	87.5	" 3	77.75	81.5
" 16	74.0	70.0	" 4	78.33	73.33
" 17	76.33	74.0	" 5	76.5	83.75

TABLE II.

OUTDOOR TEMPERATURES (FAHRENHEIT DEGREES).
1917.

Date	7 a.m.	2 p.m.	7 p.m.	Mean day	Mean night	Average daily
February 25	36.0	65.0	59.0	56.25	46.0	51.12
" 26	33.0	37.0	29.5	34.0	25.25	29.62
" 27	21.0	39.5	32.0	33.0	26.25	29.62
" 28	20.5	44.0	36.5	36.25	29.25	32.75
March 1	22.0	36.5	29.5	31 0	27.75	29.37
" 2	26.0	39.0	31.5	34.0	28.5	31.25
" 3	25.5	31.5	28.5	29.25	18.25	23.75
" 4	9.0	22.0	19.0	18.0	14.5	16.25
" 5	9.5	40.0	44.0	33.0	41.25	37.12
" 6	38.5	56.5	51.5	50.75	42 75	46.75
" 7	34.0	44.0	40.0	40.5	33.75	37.12
" 8	27.5	53.0	47.5	45.25	37.75	41.5
" 9	32.5	69.0	62.5	57.0	60.75	58.87
" 10	59.0	73.5	70.0	69.0	51.75	60.37
" 11	33.5	52.0	47.0	46.0	41.25	43.62
" 12	35.5	40.5	37.0	38.5	35.0	36.75
" 13	33.0	37.0	35.5	35.5	31.75	33.62
" 14	28.0	44.5	41.0	39.5	35.0	37.75
" 15	29.0	55.0	46.0	46.25	41.75	44.0
" 16	37.5	38.0	34.0	37.0	31.5	34.25
" 17	29.0	38.0	34.5	35.0	34.5	34.75
" 18	34.5	43.0	41.0	40.5	40.25	40.37
" 19	39.5	65.0	54.4	56.0	46.75	51.37
" 20	39.0	46.5	43.0	43.75	37.5	40.62
" 21	32.0	63.5	57.0	54.0	52.5	53.25
" 22	48.0	77.5	66.0	67.25	50.5	58.69
" 23	36.5	54.5	50.0	49.0	43.75	46.37
" 24	37.5	66.5	61.5	60.5	52.25	56.37
" 25	43.0	69.5	64.0	61.5	46.5	54.0
" 26	39.0	46.0	42.5	43.5	33.75	38.62
" 27	25.0	53.0	47.5	44.5	44.25	44.37
" 28	41.0	73.0	64.5	63.0	53.25	58.12
" 29	42.0	66.0	56.0	57.5	55.0	56.25
" 30	54.0	79.5	75.5	72.0	64.0	68.0
" 31	52.0	59.5	54.0	56.25	48.0	52.12
April 1	42.0	40.5	39.0	40.5	35.75	38.12
" 2	32.5	55.0	50.5	48.25	48.25	48.25
" 3	46.0	58.5	57.5	55.12	51.25	53.19
" 4	45.0	41.0	41.0	42.0	38.25	40.12
" 5	35.5	55.0	53.0	49.62	49.25	49.44
" 6	45.5	65.0	62.0	59.37	54.25	56.81
" 7	46.5	39.0	32.5	39.25	32.75	36.0
" 8	33.0	48.0	40.5	42.37	36.5	39.44
" 9	32.5	60.5	57.5	52.75	52.25	52.5
" 10	47.0	71.0	64.5	63.37	57.25	60.31
" 11	50.0	65.0	58.0	59.5	48.75	54.12
" 12	44.5	54.0	52.5	51.25	46.0	48.62
" 13	39.5	59.5	51.0	52.37	47.0	49.69
" 14	43.0	56.0	51.5	51.62	45.25	48.58
" 15	39.0	45.0	44.0	43.25	48.5	45.87
" 16	53.0	71.0	70.0	66.25	64.0	65.12
" 17	58.0	77.0	73.5	71.37	68.0	69.69
" 18	62.5	77.5	72.0	72.37	65.5	68.94
" 19	59.0	70.0	65.0	66.0	53.5	59.75

TABLE III. INCUBATION PERIOD. (PALEACRITA VERNATA).

Number of eggs considered	Oviposited	Hatched	Number of days in egg stage
4,364	II–27–'17	III–31–'17	32
5,288	II–28–'17	III–31–'17	31
2,948	III– 1–'17	III–31–'17	30
3,650	III– 2–'17	III–30–'17	28
4,610	III– 3–'17	III–29–'17	26
3,264	III– 4–'17	III–30–'17	26
2,591	III– 5–'17	III–30–'17	25
6,507	III– 6–'17	III–31–'17	25
11,279	III– 7–'17	III–31–'17	24
4,973	III– 8–'17	III–31–'17	23
4,411	III– 9–'17	IV– 2–'17	24
7,570	III–10–'17	IV– 5–'17	26
2,820	III–11–'17	IV– 6–'17	26
6,447	III–12–'17	IV– 6–'17	25
7,348	III–13–'17	IV–10–'17	28
3,861	III–14–'17	IV– 9–'17	26
3,463	III–15–'17	IV–10–'17	26
3,077	III–16–'17	IV–12–'17	27
6,295	III–17–'17	IV–12–'17	26
4,914	III–18–'17	IV–12–'17	25
5,090	III–19–'17	IV–13–'17	25
8,237	III–20–'17	IV–14–'17	25
5,932	III–21–'17	IV–16–'17	26
7,383	III–22–'17	IV–17–'17	26
5,347	III–23–'17	IV–17–'17	25
6,002	III–24–'17	IV–18–'17	25
2,200	III–25–'17	IV–19–'17	25
139,871	Total	Average	26

TABLE IV. OVIPOSITED.

Increments of 100 ♀ ♀	Data	1st night	2nd night	3rd night	4th night	Thereafter	Totals
A	1. Total number of eggs...	4,364	2,469	714	257	351	8,155
	2. Number of sterile eggs..	480	494	251	117	310	1,652
	3. Pctge. of sterile eggs.....	11	20	35.2	45.5	88.3	20.2
D	1. See same number above	3,650	4,610	1,088	725	257	10,330
	2. " " "	341	707	256	204	132	1,640
	3. " " "	9.3	15.3	23.5	27.8	51.4	15.9
E	1. " " "	1,065	3,264	2,691	1,170	726	8,916
	2. " " "	222	303	431	605	537	2,098
	3. " " "	19.9	9.3	16.6	51.7	74	23.6
F	1. " " "	2,656	4,595	2,048	667	139	10,105
	2. " " "	140	374	507	347	108	1,476
	3. " " "	5.3	8.1	24.7	52	77.7	14.6
I	1. " " "	2,504	4,352	1,778	620	760	10,014
	2. " " "	179	576	347	251	581	1,934
	3. " " "	7.1	13.2	19.5	40.5	76.4	19.3
L	1. " " "	1,287	5,251	1,732	503	445	9,218
	2. " " "	135	476	298	189	402	1,500
	3. " " "	10.5	9.1	17.2	37.6	90.4	16.3
M	1. " " "	2,211	3,077	679	257	386	6,610
	2. " " "	906	394	205	167	350	2,022
	3. " " "	41	12.8	30.2	65	90.7	30.6
U	1. " " "	3,861	2,708	1,205	737	725	9,236
	2. " " "	280	293	361	434	682	2,050
	3. " " "	7.3	10.8	29.9	58.9	94.1	22.2
W	1. " " "	3,639	2,808	1,346	772	578	9,143
	2. " " "	215	171	311	407	540	1,644
	3. " " "	5.9	6.1	23.1	52.7	93.4	18
Y	1. " " "	2,551	2,200	491	585	252	6,079
	2. " " "	94	183	123	219	184	803
	3. " " "	3.7	8.3	25.1	37.4	73	13.2
Grand total for 10 increments of 100 ♀ ♀	1. " " "	27,788	35,334	13,772	6,293	4,619	87,806
	2. " " "	2,992	3,971	3,090	2,940	3,826	16,819
	3. " " "	10.8	11.2	22.4	46.7	82.8	19.15

Total number of eggs deposited by 10 increments of 100 ♀ ♀ each.....87,806
Total number of sterile eggs.....16,819
Percentage of sterile eggs.....19.15
Percentage of fertile eggs.....81.85

THE DORSAL PYGIDIAL GLANDS OF THE FEMALE COCKROACH, BLATTELLA GERMANICA.*

BY E. H. DUSHAM, ITHACA, N.Y.

While engaged in the study of the body wall of the cockroach, the writer's attention was attracted by peculiar and previously unnoted structures on the dorsal side of the 10th abdominal segment of the female. These are represented in Fig. 1. D. They consist of three groups of depressions in the cuticula at the very anterior portion of the segment, one large group at the centre, and a smaller group on each side of this. These depressions are of various sizes, the larger ones, however, being found in the middle group.

In fresh material, these structures are not visible from the dorsal side, being covered by the posterior part of the 9th segment. However, by stretching the intersegmental membrane between these two segments, the depressions are readily observed, especially in material which has been boiled in potash and stained with Eosin or Gentian Violet.

Under the oil immersion lens it will be seen that the smallest depressions are single, and contain a single pore at the centre (Fig. 2). The larger depressions on the other hand include numerous smaller depressions, the number ranging from two to twenty, according to the size of the depression. Each of these smaller depressions likewise has at its centre a single pore. Viewed from the surface it will be seen (Fig. 2) that the smaller depressions with their pores at the centre, appear as well defined areas, simulating somewhat the areas which characterize the surface of the cuticula in other regions of the body. In cross-section (Fig. 3) it will be seen that what appear as lines dividing the different areas when viewed from the dorsal surface, are in reality smaller ridges. It will also be noted that the pores extend through both layers of the cuticula.

The presence of pores in the cuticula indicated that glandular structures were present in that region. Accordingly cross and longitudinal sections were made through these parts, varying in

*Contribution from the Entomological Laboratory of Cornell University.
August, 1918

thickness from three to ten micra. Dietrich's, Bouins', and Fleming's (strong formula) Fluids were used for fixation. Best results were obtained with the last fluid, although Dietrich's Fluid gave excellent results. Sections were stained with Heidenhain's Iron Haematoxylin and Delafield's Haematoxylin with Eosin used as a counterstain. Better results were obtained with the former stain, especially after fixation with the Fleming's Fluid.

Cross and longitudinal sections through the region of the pores, showed that the hypodermis was very much thickened, and apparently consisted of several layers of cells (Figs. 4 and 5). The upper layer consisted of hypodermal cells with elongate, flattened, deeply stained nuclei, with axes parallel to the surface of the cuticula, and surrounded by but little cytoplasm. They resemble the normal hypodermal cells found in other regions of the body, but are not so regularly arranged nor contiguous, being scattered here and there between the upper ends of the cells of the lower layers.

Below these smaller cells, larger cells were present, sometimes appearing as a single layer, at other times presenting the appearance of two or more layers, due to the fact that they were crowded together so that their nuclei had been somewhat displaced. Longitudinal sections showed that these lower cells were not perpendicular to the surface of the cuticula, but slanted backwards at a considerable angle. They are somewhat columnar in shape, but vary much in this respect due to their being crowded together.

The minute structure of these cells is represented by figures 6 and 7. They possess large vesicular nuclei with distinct nuclear walls, prominent nucleoli, and deeply-stained chromatin granules. The cytoplasm of the individual cells is distinctly areolar in appearance. The most striking feature about these cells though is the presence in the cytoplasm of a rounded reservoir from which extends a delicate chitinous canal which opens at the surface by one of the pores previously described. The reservoir may be either laterad or somewhat beneath the nucleus, and the canal in many cases is quite sinuous, so that in sections, only portions of it show here and there. Surrounding the reservoir the cytoplasm

is much more granular, the granules evidently being the secretion which collects in that region, and empties into the reservoir. From here the secretion is carried to the exterior through the minute canals, where it collects in the depressions in the cuticula.

What the nature of this secretion is, the writer did not determine. From the structure of the glands, and their resemblance to odoriferous glands of other insects, the writer is inclined to believe they perform a similar function in the case of the cockroach.

The writer wishes to express his thanks to Dr. W. A. Riley for his suggestions and advice in this work.

Explanation of Plate VI.

Fig. 1. Dorsal aspect of the 10 abdominal segment of the ♀ cockroach, showing location of the depressions in the cuticula. D, depressions; C, cerci.

Fig. 2. Appearance of depressions under oil immersion lens. P. pore.

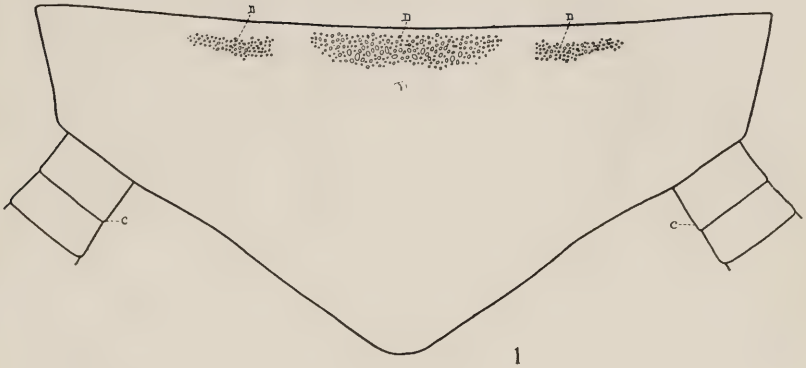
Fig. 3. Cross-section through a depression. Cu, cuticula; P, pore.

Fig. 4. Longitudinal section through the region of the pores. Cu, cuticula; Hyp., hypodermis; Gl., glands.

Fig. 5. Cross-section through the middle group of depressions. D., depression; N. Hyp., normal hypodermis; Gl., glands.

Fig. 6. Longitudinal section through the region of the pores (greatly enlarged). D., depression; Cu., cuticula; N. Hyp., normal hypodermis; Gl., glands.

Fig. 7. Glandular cell (greatly enlarged). Cu., cuticula; P., pore; C., canal; R., reservoir; B.M., basement membrane.



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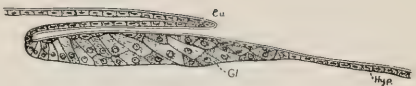

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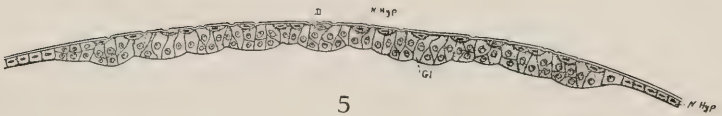

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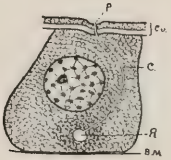


7

PYGIDIAL GLANDS OF BLATTELLA.

AN ANNOTATED LIST OF THE CERAMBYCIDÆ OF CALIFORNIA.

BY RICHARD T. GARNETT, UNIVERSITY OF CALIFORNIA, BERKELEY, CAL.

(Continued from page 252.)

182. *Ipochus fasciatus* LeConte.
Taken in Southern California; common under bark of dead willow and oak. Found by Van Dyke hibernating. May 29.

183. *Monilema semipunctatum* LeConte.
Found near Cape San Lucas, Lower California.

184. *Monilema spoliatum* Horn.
Found in San Bernardino County. Taken by Wright at San Borga, Lower California.

185. *Monilema subrugosum* Bland.
Found at San José del Cabo, Lower Californîa.

186. *Monohammus titillator* Fabricius.
Found in the middle and northern Sierras. Taken at Donner Lake by the author, July 1–12.

187. *Monohammus maculosus* Hald.
Found in the middle Sierras. Taken from pupal chambers in bark of *Pinus ponderosa* by author. July 6. (Donner Lake).

188. *Monohammus scutellatus* Say.
Found in the Sierras. Taken by the author at Donner Lake. July 7.

189. *Ptychodes trilineatus* Linné.
Taken at San José del Cabo, Lower California.

190. *Synaphoeta guexi* LeConte.
Found in the middle Sierras and Middle California. Bred from limbs of buckeye by Rivers and myself. Bred from chestnut at Los Angeles by Van Dyke (eastern chestnut). It is collected about willows in Southern California. It also breeds in poplar. Taken by author at Calistoga, Donner Lake, and Oro Grande. May 13–July 10.

191. *Acanthoderes peninsularis* Horn.
Found at San José del Cabo, Lower California.

192. *Lagochirus obsoletus* Thomson.
Found at Cape San Lucas, Lower California.

193. *Cœnopœus palmeri* LeConte.
Taken by Wright in San Bernardino County. Breeds in *Cactus opuntia*.

194. *Cœnopœus niger* Horn.
Found at El Chinche, Lower California.

195. *Leptostylus nebulosus* Horn.
Found in Washington and Nevada, and, therefore, must be present in the Sierras.

196. *Leptostylus biustus* LeConte.
Found at San José del Cabo, Lower California.

197. *Liopus crassulus* LeConte.
Bred by Schwartz from dead twigs of *Celtis texana*. Taken at Cape San Lucas, Lower California.

198. *Dectes spinosus* Say.
Breds in stems of *Ambrosia*, especially ragweed (*artemisiæfolia*), in which the larvæ hibernate. Found in Sierra San Lazaro, Lower California.

199. *Mecotetartus antennatus* Bates.
Found at Sierra El Chinche and Cape San Lucas, Lower California.

200. *Hyperplatys californicus* Casey.
Bred by Schwartz from dry twigs of *Populus monilifera* and *tremuloides* June 3. This is the western phase of *H. aspersus* Say.

201. *Hyperplatys aspersus* Say.
Found in California. Bred from apple twigs by F. X. Smith.

202. *Acanthocinus obliquus* LeConte.
Taken by Van Dyke breeding in yellow pine. Found in the Sierras from Mt. Shasta, south of Mt. Whitney. June 18.

203. *Acanthocinus spectabilis* LeConte.
Feeds on several coniferous trees, also breeds in pine stumps and logs, particularly that of yellow pine. Taken by the author from pupal chambers in the bark of yellow pine at Donner Lake. Found in the Sierras from Mt. Shasta to the San Bernardino Mts. July 1–21.

204. *Estola sordida* LeConte.
Found at San José del Cabo, Lower California.

205. *Peritapnia nudicornis* Bates.
Found in Sierra El Chinche, Lower California.

206. *Lypsimena californica* Horn.
Found by Van Dyke at Santa Monica, by Fall rarely at Pasadena, and by Fuchs in Yuba County.

207. *Pogonocherus crinitus* LeConte.
Bred from oak at Pasadena by Dr. Fenyes; bred from oak in Marin and Alameda Counties by Van Dyke. Found in Middle and Southern California. June 2–August 20.

208. *Pogonocherus concolor* Schaeffer.
Beaten by Pilate from *Fremontidendron*. Taken by Schaeffer in the middle Sierras.

209. *Pogonocherus oregonus* LeConte.
Found in the middle Sierras. Taken by Nunenmacher in Eldorado County; taken by Fall at Tahoe; thought by Van Dyke to breed in fir, probably also Douglas spruce. May 10–August 9.

210. *Pogonocherus californicus* Schaeffer.
Found in the middle Sierras; taken by Van Dyke in Placer County; taken by Blaisdell in Calaveras County; taken by Schaeffer in Tulare County. June 6.

211. *Pogonocherus volitans* LeConte.
Found at Cape San Lucas, Lower California.

212. *Ataxia setulosa* Fall.
Found in Lower California.

213. *Saperda hornii* Joutel.
Taken at Los Angeles, Northern California, and the Sierras. Taken from willow by Van Dyke and Rivers.

214. *Saperda populnea* Linné.
Found in Northern California and as far south as Los Angeles. Feeds on poplar. Taken by author by beating poison oak bushes at Felton, Santa Cruz County. July 1-4.
var. *tulari* Felt & Joutel.
Taken in Merced and Tulare Counties.

215. *Mecas inornata* Say.
Breeds in the stems of the false sunflower and in *Helianthus tuberosus*.

216. *Oberea schaumii* LeConte.
Found in various parts of California, more common in the Sierras; breeds in willow and cottonwood, taken by Van Dyke in the Sierras, breeding in live twigs of the latter.

217. *Tetraopes elegans* Horn.
Taken at San José del Cabo, Lower California.

218. *Tetraopes femoratus* LeConte.
Taken in Sierras. May 11–June 17. Very common at times on milkweed.
var. *mancus* LeConte.
Common in Southern California on milkweed.
var. *basalis* LeConte.
Common throughout the Sierras on milkweed.
var. *oregonensis* LeConte.
Found in northern Sierras on milkweed.

219. *Lianema tenuicornis* Fall.
Found at El Taste, Lower California.

220. *Idæmea fulleri* Horn.
Reported from the southern part of the State. *I. californica* is, however, the one most probably seen in this State.

221. *Idæmea californica* Fall.
Beaten by Fall from live oak at Pasadena in June; others taken by Fall at light; several taken by Van Dyke on the sea shore at Santa Monica.

222. *Styloxus lucanus* LeConte.
Found in Lower California.

223. *Methia æstiva* Fall.
Found around electric lights at Pasadena.

224. *Dysphaga debilis* Horn.
Found at San José del Cabo, Lower California.

Additions to List.

225. *Mallodon molarium* Bates.
Found at San José del Cabo, Lower California.

226. *Acyphoderes delicatus* Horn.
Found at El Taste, Lower California.

There are four species in the list which were given separate numbers which may be either synonyms or varieties (84–85, 131, 156, 199). Therefore, there are 178 unquestioned species confined to California, 10 present both in California and Lower California, and 43 confined to Lower California.

THE PROBABLE ANCESTORS OF INSECTS AND MYRIOPODS.*

BY G. C. CRAMPTON, PH.D., AMHERST, MASS.

In view of the fact that such Crustacea as *Bathynella*, *Apseudes*, etc., so obviously fulfil the conditions one would naturally look for in those forms which are supposed to have departed as little as any from the ancestral condition of insects, it is indeed surprising that they have been passed over in silence (although they have been known to science for many years) despite all of the speculation concerning the nature of the ancestors of insects, and the various forms which have been put forward as the probable ancestral types. A comparative morphological study of the forms in question, however, has convinced me that they represent quite closely some of the types from which insects have sprung, and I would, therefore, maintain that the Anomostraca (e. g. *Anaspides*, *Koonunga*, *Bathynella*, etc.) and the Isopoda-Amphipoda group (e. g. *Apseudes*, *Ligia*, *Gammarus*, etc.) contain certain forms very like some of the ancestors of both insects and "myriopods" (*sensu lato*).

It should be clearly understood that neither the first insects, nor their immediate ancestors, were of any one single type; but from the very first, the ancestral insects differed greatly among themselves—although the degree of variation may not have been as great as that between the different representatives of present-day Apterygota. Some of the ancestral insects were doubtless quite like the Protura, while others may have borne a stronger resemblance to the campodeoid or other types of apterygotan insects; but the Protura have departed as little as any known insects from the primitive condition of the hexapodan group as a whole, although they have not retained certain primitive features preserved in other representatives of the apterygotan group.

The developmental tendencies which were to result in the production of a proturan type of insect with long slender body, composed of approximately twenty-one segments (allowing six for the head region, three for the thorax and twelve for the abdomen),

*Contribution from the Entomological Laboratory of the Massachusetts Agricultural College, Amherst, Mass.

August, 1918

bearing three pairs of "stumpy" legs in the abdominal region with reduced terminal appendages, etc., etc., are "foreshadowed," so to speak, in the *Bathynella* type of Crustacea, in which the body is also long and slender, and appears to be composed of approximately twenty-one segments. In *Bathynella* also, there is a marked tendency toward the reduction (or shortening) of the terminal appendages, and the last five segments of the body have lost their limbs completely, while the hindmost legs exhibit a marked tendency to become shortened and reduced—a condition which, if carried a little further, would result in the production of a creature in many respects quite similar to a proturan insect.

On the other hand, the "Isopoda-Amphipoda" group of Crustacea (including the Tanaidacea) exhibit many developmental tendencies which find opportunity for expression in certain other Apterygota. Thus the multiarticulate terminal appendages of such forms as *Apseudes* are suggestive of the many-segmented, paired cerci of such Apterygota as *Lepisma*, *Machilis*, etc., and the nature of the limbs, head, mouth-parts, and other structures in the Isopod-Amphipod group, is strongly suggestive of the condition found in certain Apterygota, even in regard to the minuter details. If we admit the possibility of the ancestors of insects differing markedly among themselves (as there is every reason to suppose was the case) it is, therefore, quite probable that some of them resembled the anomostracan type of Crustacea, while others probably resembled the isopod or amphipod type of crustacean.

It is quite probable that the ancestral "myriopods" were similar in many respects to the members of the "Symphyla-Pauropoda" group, and it would be a comparatively simple matter to derive these types from crustacean forms allied to *Bathynella* or other Anomostraca. If we assume that both the apterygotan type of insect and the Symphylo-Pauropodan type of "myriopod" were derived from crustacean forms allied to those mentioned above, it is evident that the myriopodan type in question has followed a course of development very close to that of the lower apterygotan insects; and in certain respects these "Myriopoda" have departed less from the ancestral condition than the most

primitive representatives of the Apterygota have, so that a study of the "Myriopoda" in question is fully as important for a phylogenetic study of insectan evolution, as that of the above-mentioned Crustacea.

Any attempt to derive winged insects from forms unlike the apterygotan type of insect is wholly unwarranted, to my mind, since the lowest winged insects, such as the ephemerids, Plecoptera, etc., are anatomically strikingly similar to such Apterygota as the Lepismids, etc., which in turn are connected by intermediate forms with the lowest Apterygota such as the Protura: and no one who has carefully examined the Protura could doubt that in them we have the most primitive known representatives of the insectan group; so that the recent attempts to derive winged insects directly from a trilobite type of arthropod (without reference to the Apterygota) are extremely "far fetched," to say the least, and even the weight of Handlirsch's authority as a palæontologist is insufficient to convince a skeptical morphologist, when the evidence of anatomy is directly against Handlirsch's assumption—although many recent writers who have not taken the trouble to investigate the merits of the case, have unhesitatingly accepted Handlirsch's astonishing proposal that winged insects are to be derived directly from a trilobite type of arthropod without reference to the Apterygota, and regardless of the facts indicated by a comparative anatomical and embryological study of apterygotan and pterygotan insects.

Even if one were to grant, for the sake of argument, that the anatomically and embryologically far more primitive Apterygota are not so near the ancestral type of insect as the Pterygota are, we would not be justified in assuming that the Pterygota are to be derived from a trilobitan type of arthropod, since, as I hope to bring out in a more detailed discussion of the question, the Trilobita are more closely related to the Merostomata than to any other arthropods (save perhaps the Apodidæ), and serve to connect the Apodidæ with the Merostomata in a line of development leading *away from* that of insects and *toward* the *arachnid* line of evolution, instead of the trilobites standing more nearly in the direct line of descent of the insectan type of arthropod. Insects

may perhaps also be derived from arthropods similar to the Apodidæ, or the Branchiopoda, but their line of development leads through such forms as the Leptostraca (and their relatives), to the Cumacea, Tanaidacea, and Anomostraca; while the line of development of the arachnids leads from the Branchiopoda, or Apodidæ, through the trilobites to the Merostomata, Eurypterida, etc., as can be readily seen by comparing such fossil merostomes as *Bunodes lunula* and other antenna-bearing Merostomata, with the Trilobita.

I would, therefore, maintain the following points: 1. That the trilobites do not stand in the direct line of descent of insects, but rather in a side branch leading off from the Branchiopoda and Apodidæ to the Merostomata, Eurypterida, and other arachnoid forms. 2. That the line of development of insects leads from the branchiopod (and apodid) type of arthropod, through such forms as the Leptostraca and their relatives, to the Anomostraca, Tenaidacea, and other crustacean forms which have preserved many features characteristic of the ancestors of insects and "myriopods". 3. That the members of the Symphyla-Pauropoda group are in many respects quite similar to certain of the ancestors of the "myriopods" in general, and that the members of the Symphyla-Pauropoda group are likewise very similar to certain ancestral insects, whose line of development is quite closely paralleled by that of the "myriopods" in question. 4. That the Apterygota in general have departed the least from the ancestral condition of insects as a whole, and the Protura are as primitive as any known Apterygota. 5. That apterygotan forms such as the Lepismids, etc., are very like the ancestors of winged insects and are structurally very closely related to the ephemerids and Plecoptera, which, with the fossil Palæodictyoptera, are the most primitive representatives of the pterygotan group. The details of the discussion of the evolution of insects, together with the grouping of the orders into super-orders containing the forms which are anatomically the most closely related, will be taken up more at length in a later paper dealing with the latter phase of the subject.

Mailed August 24th, 1918.

The Canadian Entomologist.

VOL. L[illegible] LONDON, SEPTEMBER, 1918 No. 9

POPULAR AND PRACTICAL ENTOMOLOGY.

NOTES ON A CECROPIA CATERPILLAR.

BY MRS. ANNIE G. HEWITT WHITE, TORONTO.

On a lilac bush in my garden I was fortunate enough, in late September, to find a fine specimen of the large green caterpillar of the Cecropia Moth. Cutting the branchlet holding the handsome sojourner, I mounted it on a large potato, to keep the leaves fresh, and placed a battery jar over it.

About 10 o'clock on the night of the 23rd of September, the caterpillar began spinning its cocoon.

Sept. 25th.—Outer wall of cocoon finished and looks like a transparent, silk basket. The caterpillar still moving in that peculiar figure-of-eight, that I have observed seems to be the motion which all spinning caterpillars adopt.

Sept. 26th.—Cocoon almost opaque, shaped like an airship, 3¾ inches long, 1 7/8 inches wide. Caterpillar dimly seen within, still moving.

Sept. 28th.—Cocoon complete; all quiet within.

Oct. 8th.—Heard a scratching sound. Thought it was a mouse and instituted a search. Traced the sound, which seemed now more like silk being torn, to the corner where the cocoon was placed. It continued the whole evening.

Oct. 9th.—Scratching still continues, 8 o'clock, p.m. Can no longer resist the temptation to see what is going on, will wait a day.

Oct. 10th, 8 p.m.—Opened the cocoon, and saw one of the most wonderful of Nature's workings that has ever been vouchsafed to me.

Carefully cutting open the side of the cocoon, and turning down the flap made, I had a window-like opening by which to watch the proceedings. The caterpillar, still unchanged, stood on end within the smoothly-lined cocoon, his gaily coloured tubercles as bright as ever against the pale, green body.

Suddenly he rose and fell, as if heaving a deep sigh. Then he began a curious swaying movement, round and round, or from side to side, much like the movement of a bear.

At last, the skin at the back of his neck cracked open, and his motion became more violent. Extending himself to his greatest length he raised his first pair of legs, the others moving also, but not to such extent, as if praying for help. Then he drew down, down, till he seemed to crouch in despair.

Keenly excited now I gently opened the cocoon-window wider, and now the reason for the decorations of gaudy tubercles was explained.

As he moved in the various directions the spines rubbed against the wall of the cocoon, and thus aided him in discarding the larval skin. The crack in the skin had meanwhile greatly lengthened, and the head parts and leg cases slowly slid downward. It was very much like a child taking off a frock after the back is unbuttoned.

Now appeared to my enraptured gaze a totally new creature. A creature of soft, velvety folds of a golden yellow, with gelatine legs and heavy antennæ (it was evidently a male). The wings, as if folded many times, lay in thick clumps on the body, and the lower body wore the stripes of the perfect moth.

The swaying motion still kept on, the skin moving ever downward till neatly packed away, it formed the masque or cushion found in the empty cocoons.

Now from the segments of the body and seemingly from openings about the head, a yellow varnish began to exude, which gradually covered the whole creature; smoothing down the antennæ and legs, and levelling the wings with the body, till all the parts looked as if covered with yellow glass.

The change of form commenced at about nine o'clock in the evening. It was two o'clock in the morning when completed. The pupa still moved faintly, and was quickly turning a dark brown.

I sealed up the cocoon carefully, and put it away in a cold place to await further developments.

In June the moth came out in perfect order, none the worse for the evening's education it had afforded me.

A NEW ISOTOMA OF THE SNOW FAUNA.

BY J. W. FOLSOM, URBANA, ILLINOIS.

This Canadian species of *Isotoma* is here described in order that its name may be used in a forthcoming article on insects of the snow by Mr. Charles Macnamara, after whom the new collembolan is named. He writes: "This species seems to be confined to wooded swamps; I have never seen it elsewhere; and it sometimes comes out on the snow in small numbers. This is the only pugnacious springtail I have ever observed. It almost always attacks an *Achorutes* put in the same vial with it and sometimes kills it."

Isotoma macnamarai, new species.

Olive green. Legs and furcula pale. Body segments bordered narrowly with black. Head conspicuously large in proportion to the body (fig. 1). Eyes (fig. 2) 8+8, on black patches. Postantennal organs absent. Antennæ four-fifths as long as the head, with segments in relative lengths as 8, 12, 13, 21; fourth segment elliptical. Sense organ of third antennal segment with two geniculate sense clubs (fig. 3). Fourth antennal segment with slender curving sense hairs. Unguis stout (fig. 4), with a proximal outer pair of small teeth and with a conspicuous inner tooth one-third from the base. Unguiculus more than half as long as unguis, broadly lanceolate, unidentate at the middle of the inner margin. Tenent hair single, unknobbed. Third and fourth abdominal segments subequal in length. Fifth and sixth abdominal segments not ankylosed. Furcula apparently appended to the fifth abdominal segment, gradually tapering and short, extending a little beyond the posterior margin of the second abdominal segment. Manubrium and dentes subequal in length. Dentes crenulate dorsally. Mucrones two-fifths as long as hind ungues, quadridentate (fig. 5); apical tooth short, not hooked; second and third teeth large, subequal; fourth small, lateral, at base of third. Rami of tenaculum quadridentate; corpus with ventral setæ. Clothing of abundant strong curving setæ of moderate length (fig. 6), with long, outstanding, simple sensory setæ, of which there are several pairs on the fourth and the fifth abdominal seg-

ments, and one pair on each of the remaining segments except the prothoracic, which has none. Maximum length, 1.8 mm.

This species is nearest *Isotoma grandiceps* Reuter, from Siberia and St. Lawrence Island, Alaska, but differs from the description of *grandiceps*, particularly in the form and markings of the head, the colour of the body, number of eyes, and number of mucronal teeth.

Arnprior, Ontario, Canada, December to April, inclusive; Charles Macnamara. Ten cotypes.

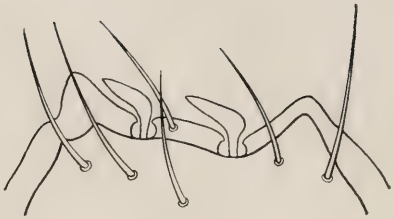
Explanation of Plate VII.

Isotoma macnamarai.—Fig. 1. Dorsal aspect, from photomicrograph by Mr. Macnamara, X 35. Fig. 2. Eyes of left side, X 346. Fig. 3. Sense organ of third antennal segment of right side, X 1120. Fig. 4. Right hind foot, X 653. Fig. 5. Right aspect of right mucro, X 653. Fig. 6. Setæ, median dorsal line of third abdominal segment, X 346.

ENTOMOLOGICAL COLLECTIONS OF THE LATE W. H. HARRINGTON.

The Entomological Collections of the late Mr. W. H. Harrington have been acquired by the Entomological Branch of the Department of Agriculture, Ottawa, and will be incorporated in the Canadian National Collection of Insects. The collection is particularly rich in the parasitic families of the Hymenoptera in which Mr. Harrington was specially interested. It contains a number of types of Provancher's species, as indicated in Messrs. Gahan and Rohwer's account of the "Lectotypes of the Species of Hymenoptera (except Apoidea) described by Abbé Provancher," given in several issues of *The Canadian Entomologist* from volume 49, No. 9, p. 298 to volume 50, No. 6, p. 196; accordingly, any types described as being in the Harrington Collection will now be found in the National Collection at Ottawa.

2



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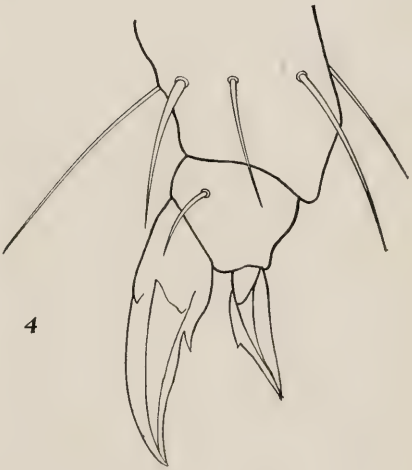

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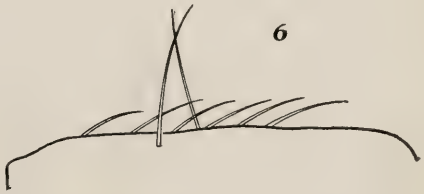

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J. W. FOLSOM

ISOTOMA MACNAMARAI, n. sp.

See p. 292.

GEOMETRID NOTES—HYDRIOMENA.

BY L. W. SWETT, LEXINGTON, MASS.

The recent issue of Barnes and McDunnough's "Contributions to the Natural History of the Lepidoptera of North America," vol. IV, No. 1, contains an excellent "Revision of the Genus Hydriomena". It is a vast improvement on any former revision, as it is illustrated by excellent plates including figures of the genitalia. The work gives evidence of great pains and careful study and is based on large series of specimens, which unfortunately were lacking to the present writer in his original work on this genus. I would suggest that in order to supplement the revision the future student might work out the egg and pupal structure including the cremaster thorn and the life-histories, which would render it practically complete. In my early paper (Can. Ent., vol. 43, March, 1911) I attempted to straighten out the group on the basis of the palpal structure. I had little material and most of this was loaned, so that I could not study the genitalia, as stated in my article. From the date of my publication until two years ago I had received few additions in this group, and so had no chance to work out the life-histories. Barnes and McDunnough's paper with the figures of the specimens and the genitalia, is quite an advance over my early attempts. During the past year or two I had been in correspondence with Dr. McDunnough on the species of Hydriomena and their genitalia, with the result that except in one or two points we were practically of the same opinions. I have, therefore, very little to add to this valuable work except a few notes on the species. I believe that this classification, based on the genitalia and palpi, is on a sound basis and will be little changed.

Dr. McDunnough's separation of *H. furcata* Thunberg and *quinquefasciata* Packard is a painstaking piece of work. I could not separate these in my early paper as the material was all loaned, and it was only recently after I had made slides of the genitalia that I realized the differences between them.

In regard to *H. albifasciata* Pack. Dr. McDunnough is quite correct. I had only the female to judge by, and it was impossible to place the species correctly without the male. *Resecta* seems also to be a suffused, ruddy form of *albifasciata*, but it may later

prove that we are in error, and in that case the only species it could be referred to is *abacta*. Dr. Taylor and Mr. Grossbeck were the first to suggest the relationship between *albifasciata* Pack. and *reflata* Grote, as pointed out on page 78 of my paper. Dr. McDunnough, on p. 12 of his "Revision," associates *banavahrata* Strecker with *nubilofasciata* Pack., which is better than Dr. Dyar's reference to *californiata* Pack. A year or so ago I ran across a sketch of the type, made by Mr. Grossbeck, and this showed it to be *nubilofasciata* by the outer terminal bands on the primaries. If this sketch was made from the type, and I have every reason to believe it was, then *banavahrata* will fall under *nubilofasciata*. I shall restrict the type of *nubilofasciata* Pack. to the male in the Packard collection, as the female is badly rubbed and is possibly not the same species. The male type of *nubilofasciata* has a reddish shade to the central or mesial space.

In regard to *H. manzanita* Taylor I think this species, or a form of it, occurs in California, as Dr. McDunnough states, though sparingly. I have recently seen three or four rubbed specimens from there.

I have little to add to Dr. McDunnough's remarks (p. 17) on *H. frigidata* Walker and *transfigurata* Swett, except that I believe the labels, in some unaccountable way, were mixed on a specimen from New Brighton, Pa. I do not remember having seen *transfigurata* from Mr. Merrick, but I had several *frigidata* which I sent to Mr. Prout to be compared with Walker's type. Mr. Prout stated that they were the same as *frigidata*. It must have been one of these females, upon which I accidentally put a wrong label, as I knew both species at the time and would not have confused them. *Hydriomena transfigurata* is a rare species and is of a rather uniform, pale green colour. *H. niveifasciata* Swett seems to be correctly placed as a form of *irata*.

Dr. McDunnough's most startling discovery was concerning the types of *H. chiricahuata* Swett (p. 29); viz., that they were not conspecific. I distinctly remember that they were alike in markings, and the fact that he noted the same, goes to prove the value of genital characters in closely allied species. Future work on this group should be based on very large series from all localities, and on field notes.

I think I may have confused Dr. McDunnough on *bistriolata* Zeller, as I was mistaken in supposing the Cambridge specimen to be a paratype. I have made a careful study of Zeller's descriptions and Dr. Hagen's methods, and find that the error may be laid to Packard's door, where he states in the Monograph that he has Zeller's types. Unless Zeller states that the specimens are in the museum at Cambridge they cannot be considered as types, as his descriptions indicate. Hagen appears to have sent specimens to Zeller and placed a yellow label on the specimen agreeing with those he sent; hence they may be considered as having been merely compared with the type. This does not alter our conception of the species as both Dr. McDunnough and I knew it, but changes the fixation of types.

I have positively identified the type of *glaucata* Pack. as the specimen in the Henry Edwards' collection, so labeled. I find in the older plates of the Boston Society of Natural History the wings are reversed, so by a careful comparison of holes and tears in the wing I was able definitely to place it. Mr. Frank Watson has again checked my notes and made comparisons verifying my conclusions. In the original Henry Edwards' catalogue, for No. 1375, he gives "Santa Clara Co., California, taken at rest in forest, on a pine tree, in June." The specimen was originally mounted on a headless brass pin, but was repaired and remounted on May 2, 1917, and stands as No. 13197, Henry Edwards' collection.

Hydriomena edenata Swett has more elongated primaries than *glaucata* Pack. Apparently Dr. McDunnough has a closely related form, shown on pl. VI, fig. 4, but the basal and mesial lines do not exactly match the type of *glaucata*.

H. regulata looks superficially like a suffused form of some of the *speciosata* group.

H. periclata Swett should be placed as a form of *H. quinquefasciata* Pack., rather than *furcata*, the type having a broken uncus, and a recent second specimen showing the correct location of the form. I am to blame for this, rather than Dr. McDunnough, as in my notes to him on the species I so placed it incorrectly owing to this defect in the type and the lack of other material. The receipt of two males recently from the same locality enabled me to place it correctly.

I have still another new species of *Hydriomena*, which I

received from the Provincial Museum, Victoria, B.C., through Mr. E. H. Blackmore. It may be described as follows:

Hydriomena macdunnoughi, sp. nov.

This species has a very close resemblance to *H. ruberata* in colour and style of markings, and can be best compared with that species.

Palpi moderate, front of head dark ashen, thorax and abdomen fuscous. Fore wings dark ashen gray with a ruddy tinge. The basal band runs straight across the wing, except where it bends outwardly on the median vein and again sharply outwards at vein 1. The mesial band as a whole is smoky fuscous with a ruddy tinge and crossed through the middle by the usual watery band. The intradiscal, black band runs straight to median vein, then makes an incurve to inner margin. Mesial space quite narrow, pale ashen with a ruddy tinge, and containing a prominent, linear, discal dot. Extradiscal line running almost straight across the wing, irregularly scalloped inwardly on the veins. Marginal area ruddy grey with a smoky, curved band running through the centre. There are geminate black dots at the base of the fringe. Hind wings dark, smoky gray with a prominent black, curved band beyond the discal spot.

Fore wings beneath smoky with two outer curved bands beyond the discal spot. Hind wings of same colour with a prominent, black, curved extradiscal line, beyond which is a second faint line.

The fringe on all the wings is short and fuscous.

The palpi in this species are much shorter than in *ruberata*, and the general colour is a darker smoky fuscous with ruddy tinge. The course of the basal and median bands is different from that of *ruberata*. The uncus is broader near the tip, and the valvae do not narrow as in *ruberata*, but are broad and full one-third back from the tip.

Expanse 28 mm.

Holotype.—♂, Atlin, B.C., June 11, 1914, from E. H. Blackmore, in the writer's collection. *Allotype.*—♀, Atlin, B.C., June 11, 1914, in Mr. Blackmore's collection.

Paratypes.—3 ♂'s, Atlin, B.C., June 11, 1914, in coll. Blackmore, and 1 ♂ of above date in collection of the writer.

I have named this species after my friend, Dr. Jas McDunnough, in recognition of his excellent work on the genus *Hydriomena*.

NEW SPECIES OF ODONATA FROM THE SOUTH-WESTERN UNITED STATES.

Part II.

BY CLARENCE HAMILTON KENNEDY,
Cornell University, Ithaca, N. Y.

The following undescribed species have been in the writer's hands for some time awaiting that time when he had hoped to be able to write a more comprehensive paper covering this region.

I wish to thank Dr. P. P. Calvert for the privilege of decribing the Æschna from his collection, and Prof. S. J. Hunter for the privilege of describing the material from the Snow collection.

Erpetogomphus lampropeltis, n. sp.

Holotype.—Male caught by the writer on Sespe Creek, Fillmore, Ventura Co., California, Aug. 7, 1915, and now in the U. S. National Museum.

Paratype.—Female *not* in copula with the holotype but with the same data, now in the U. S. National Museum.

Male.—Length of abdomen 30 mm.; appendages 2 mm. Length of hind wing 25 mm.

Colour.—Face pale gray, with a brown line along the labral suture and one on the fronto-nasal suture. Vertex brown; antennæ black ringed with yellow. Rear of head mottled with gray and brown. Eyes bluish gray above shading into gray below.

Thorax with the dark markings dark brown, the pale areas gray as follows: Dorsum brown with the middorsal and meso-stigmal keels gray. Antealar ridges brown. A narrow (2/3 mm. wide) antehumeral pale stripe sloping outwards from the antealar sinus. A second hair line of gray just anterior to the humeral suture, this line widened above to a triangular spot. Side of thorax gray with an irregular brown line on first lateral suture (½ mm. wide), and a similar brown line on second lateral suture. These are connected at about one-fourth their length from the alar ridge. Wings hyaline with black pterostigmata. Legs with coxæ and femora gray; the latter with a broad, dorsal brown stripe; tibiæ and tarsi black.

Abdomen with the pale markings on segs. 1–7 gray (almost white) and on segs. 8–10 an intense and vivid orange brown.

All dark markings intense black except on segs. 1 and 2, where they are brown. Seg. 1 brown with a large gray spot on its lower posterior angle. Seg. 2 brown with a middorsal pale stripe, the auricle and the lower posterior angle pale. Seg. 3 pale with its side nearly occupied by an anterior and a posterior black spot. Segs. 4–6 black with a pale band on the basal third. Seg. 7 similar but the pale band occupying the basal half. In life this band is very conspicuous because of the great amount of black before and after it. Segs. 8 and 9 with the dorsum black, the apical edge and the lower half of sides orange. Seg. 10 orange, browner at its base. Appendages yellow.

The appendages are like those of *crotalinus* and *designatus*. The tips of the dorsal pair are not as slender as in *designatus*, and the dorsal angle or hump is near the middle of the appendage. The inferior appendage is as in *designatus*.

Female.—Abdomen with appendages 36 mm. long; hind wing 30 mm.

Colour.—As in male but with the brown on segs. 1 and 2 reduced to an apical ring and a broad, lateral stripe. Segs. 3–7 each with a broad, middorsal, lanceolate, pale spot and a pale spot on the lower edge of the side. Segs. 8–10 as in the male.

The vulvar lamina is similar to that of *designatus* but the lateral lobes are broadly triangular, two-fifths as long as seg. 9, and terminate in acute points caudad.

The nearest relative seems to be *designatus*.

This is named after the handsome black-and-white banded king snake of California.

Æschna arida, n. sp.

Holotype.—Male, from Fort Wingate, New Mexico, and now in the collection of Dr. Calvert.

Paratype.—Female, from "Oak Creek Canyon, Arizona, 6,000 ft., Aug., F. H. Snow." This is one of a pair in the Snow collection of Kansas University, at Lawrence, Kansas.

The male of this pair in the Snow collection bears the same pin label as the paratype, and is referred to in the description as the "second male."

Male.—Colour; face greenish, labrum with a black line across its articulation; a narrow fronto-nasal line. T-mark conspicuous,

its stem triangular. Frontal vesicle edged with yellowish above. Occiput small and pale, rear of head black, eyes brown (dried material) with a conspicuous dash.

Thorax brown. Dorsal stripes 1 mm. broad; enlarged at the upper end. Lateral stripes yellowish, (probably greenish in life with yellow ends). Both are broad and straight; the anterior being slightly notched at the middle of its anterior edge and narrower from there to the upper end. Anterior stripe 1.5 mm. wide below, slightly narrower in its upper half; the posterior stripe nearly 2 mm. wide.

Each lateral stripe bordered on both edges of its entire length with a wide band of dark brown. Wings hyaline, stigmata 4 mm. long in type; 3 mm. in second male, dark brown above, yellowish below. Legs black with the bases of the femora dark brown.

Abdomen brown on segs. 1–3, black on 4–10 with blue markings. The figure shows the shape of these.

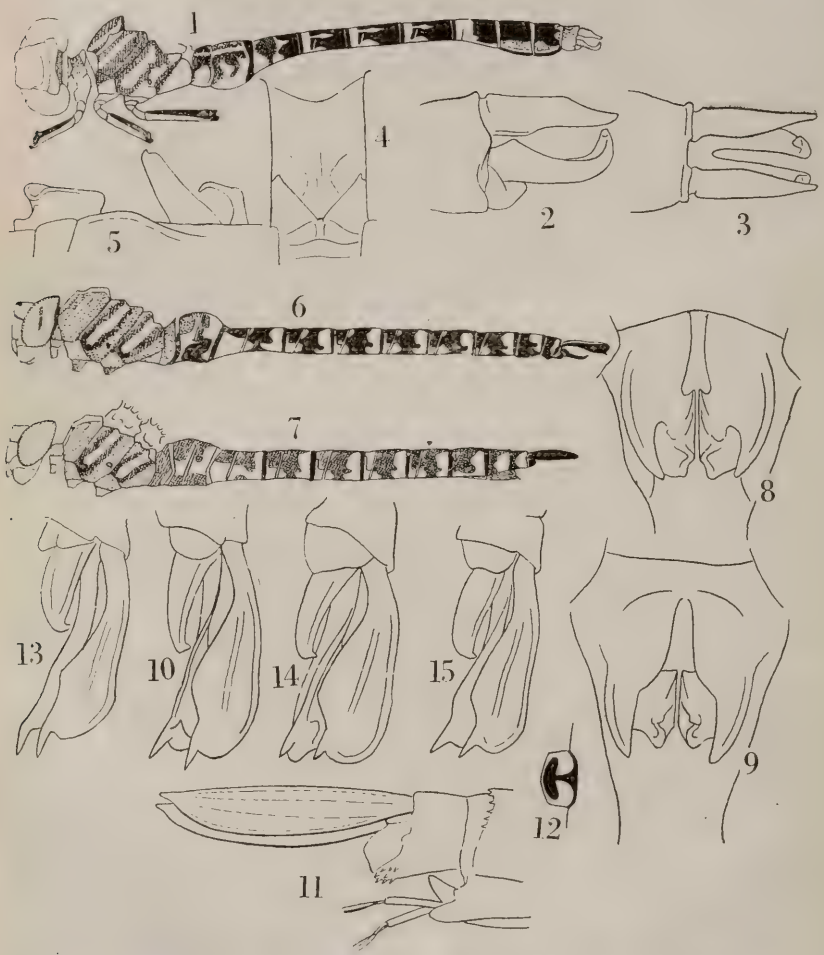
M D present on segs. 3–7, P D is very large and roughly triangular, fusing broadly below with P L. M L is present on segs. 3–8. A L present on segs. 2–8. A narrow, apical band on seg. 10. Ventral surface probably black.

Female.—Colour—as in the male but with the brown of the thorax paler. Veins of wings brown. Abdomen brown, becoming darker caudad.

This species is close to *constricta*, *palmata* and *walkeri*. See figs. 6–15. The male appendages are broad as in *walkeri*, but have the long terminal spines of *constricta*. The hamules show few characters different from those of the above species. In the type male these are thrown caudad with the extruded penis, hence the difference between the figs. 8 and 9. In colour the male differs from its relatives in the broad, lateral stripes and the wide, dark borders to these. From *walkeri* in the presence of M D. From *constricta* in the presence of P L on segs. 5–8. From *palmata* in the greater amount of blue on the abdomen. The female is easily distinguished by the appendages which are narrow, heavy and *nearly straight on the dorsal edge.*

The name refers to the desert region in which are the more humid mountains from which the types have come.

CAN. ENT. VOL. L. PLATE VIII



NEW ODONATA FROM THE SOUTHWESTERN UNITED STATES.

See p. 297.

Figs. 1—5. *Erpetogomphus lampropeltis.* 1. Male colour pattern. 2—3. Male appendages 4. Vulva. 5. Male second segment.

Figs. 6—12. *Æschna arida.* 6. Male colour pattern. 7. Female colour pattern. 8. Hamules of "second male". 9. Hamules of Holotype. 10. Appendages of male. 11. Appendages of Paratype. 13. *Æschna constricta.* 14. *Æschna walkeri.* 15. *Æschna palmata.*

POLLINATION OF ALFALFA BY BEES OF THE GENUS *MEGACHILE*. TABLE OF CANADIAN SPECIES OF THE *LATIMANUS* GROUP.

BY F. W. L. SLADEN, APIARIST, DOMINION EXPERIMENTAL FARMS.

A study has been made of the species of bees that trip and therefore, presumably, pollinate the flowers of alfalfa in the parts of Canada where this plant is or can be grown for seed.

In July and August, 1916, the females of a species of leaf-cutter bee, *Megachile diligens*, Sladen* (*latimanus* Cockerell, not of Say) were found to be visiting the fields of alfalfa in bloom and tripping the flowers in considerable numbers at Medicine Hat and Lethbridge, Alta., each flower visited being tripped. The same thing was noticed in 1917, when they were observed to be tripping the flowers at an average rate of 17 per minute. This species was more numerous in the alfalfa fields than five other species of *Megachile* together, (*perihirta* Ckll., *calogaster*, Ckll., *vidu* Sm., *manifesta* Cr. and *brevis* Cr.) all of which performed the same service. Several species of bumble-bees, fairly plentiful, worked more slowly and often failed to trip the flowers. Honey-bees, also plentiful, visited the flowers without tripping them.

Observations made on July 20, 1917, at Summerland, B.C., and on July 21, at Keremeos, B.C., gave the same results, except that *perihirta* was the abundant species, *M. diligens* not having been met with in British Columbia.

M. perihirta was found nesting gregariously in a nearly new and bare gravel railway embankment at Cochrane, Ont., on August 9, 1917. A nest of the same species was found in a nearly new gravel road leading to a dwelling house at Invermere, B.C., in July, 1914. There is, therefore, some hope that *perihirta* might be encouraged to breed in the vicinity of alfalfa fields by spreading gravel and making it firm by rolling. *Diligens* might also be encouraged in this way because it is very closely related to *perihirta* and probably has similar nesting habits.

Closely related to these two species is a third, *latimanus* Say, found in Southeastern Canada. These three species constitute

*The name *diligens* was first used in the Agricultural Gazette of Canada, Feb. 1918, p. 125.

what may be called the *latimanus* group to which Robertson gave the name *Xanthosarus*.

The males of all three species were taken at the wild liquorice (*Glycyrrhiza lepidota*) at Lethbridge on June 28, 1914. The flowers of this plant wither about the middle of July, and *diligens* was found in abundance on *Psoralea argophylla* within the railway fence between Redcliff and Medicine Hat on July 31, 1917. As both these plants are *papilionaceous*, it is not surprising that alfalfa should prove attractive to these bees. The females of *diligens* show considerable hostility to a person trespassing in the alfalfa fields by zigzagging before him more frequently and more menacingly than bumble-bees do in a field of red clover, but they do not attempt to sting.

The females of the *latimanus* group are very active and energetic, far more so than honey-bees or bumble-bees. Their industry is equalled only by that of *Clisodon terminalis* (*Anthophora furcata* of Europe) which has not been observed at alfalfa except at Ottawa. *Perihirta* shows melanism in the north and on the Pacific Coast. No species answering to the description of the *latimanus* group is recorded in Friese's monograph of the European species of *Megachile* in "Die Bienen Europas," published in 1899.

As the species of the *latimanus* group are very closely related, and not easy to separate, especially in the females, the following table will be useful:

Latimanus Group. (**Xanthosarus** Rob.)

♂.—Fore tarsi dilated, middle femora swelled so that they are stouter than hind femora, *middle basitarsi with a large process or tooth on underside.*

♀.—Large, length 12 to 15 mm. pollen brush pale red, paler at base, white felt hair bands on the apical margins of abdominal segments 3 to 5; 6th dorsal segment well clothed with comparatively long hair which becomes shorter and decumbent towards and at the apex. This hair is white to pale golden but black in northern localities, *and there are always some pale, reddish hairs on the sides of the 6th segment.*

MALES.

1. *Process on middle basitarsi narrow and ridge-like.* Pile pale yellow-brown, becoming paler on exposure. Abdomen densely

clothed, the pale felt bands on the apices of segments 2 to 5 scarcely developed. Length 11 to 13 mm.....*perihirta* Ckll.

Haileybury, Ont.; Cochrane, Ont., (on *Epilobium angustifolium*), August 8, 1917; Lethbridge, Alta.; June 29, 1914; common at Summerland, B.C., Keremeos, B. C., and Victoria, B.C., in July.

Process on middle basitarsus nearly as wide as basitarsus.....2

2. Pile bright yellow-brown, fading on exposure to pale yellow-brown, abdomen densely clothed, the pale, felt bands on the apices of segments 2 to 5 scarcely developed. Process on middle basitarsus rounded. Anterior tibiæ pale below. *No spine in front of the middle coxæ.* Length 12 to 14 mm.....*latimanus* Say.

Digby, N.S.; Ottawa, Ont.; Aweme, Man.; Melfort, Sask.; Lethbridge, Alta.

Pile very pale yellow-brown, fading on exposure to white. Segments 4, 5 and 6 sparsely clothed. Well-marked white felt bands on apical margin of segments 3, 4 ,5. Process on middle basitarsus with minute crest at apex. Fore tibiæ black on basal half above. *A spine in front of the middle coxæ.** Length 12 to 14 mm.....*diligens* Sladen (*latimanus* Ckll. not of Say).

Common at Medicine Hat, Alta., and Lethbridge, Alta., throughout July and August.

FEMALES

1. Pile on thorax and base of abdomen greenish white, soon becoming white. Few or no black hairs on upper side of thorax (hairs on disc of thorax short and easily rubbed off). *White felt bands on apical margin of segments 3, 4 and 5 wider* (about .25 mm. wide in centre of segment 4). Hair on segment 6 entirely pale. Pollen brush pale red only on apical part.....*diligens* Sladen (*latimanus* Ckll. not of Say).

Common at Medicine Hat, Alta.; Redcliff, Alta., and Lethbridge, Alta., throughout July and August.

Pile on thorax and base of abdomen pale brownish yellow, be-

*This remarkable character was pointed out to me by Mr. J. C. Crawford.

coming paler on exposure. A patch of black hair on centre of upper surface of thorax. *White felt bands on apical margin* of segments 3, 4 and 5 *narrower* (about .15 mm. wide or less in centre of segment 4) and narrowed or interrupted in centre, at least on segments 3 and 4. Pollen brush more extensively red.....2.

2. Hair on segment 6 denser, never mixed with black. Apical felt band on segment 5 never interrupted in middle. Black patch on thorax never large. Red of pollen brush somewhat paler... .....*latimanus* Say.

Fredericton, N.B.; Ste. Anne de la Pocatiere, Que.; Ottawa, Ont., common on sunflowers; Toronto, Ont.; Aweme, Man.; Lethbridge, Alta.; July and August.

Hair on segment 6 less dense, usually pale and almost entirely black in specimens from Northern Ontario and Northern Alberta; these specimens and specimens from Victoria, B.C., have the white felt bands, on apices of segment 3 and 4, and also sometimes on segment 5 very weak and widely interrupted in middle. Black patch on thorax larger (in specimens from Northern Ontario and Northern Alberta covering almost the entire upper surface). Red of pollen brush somewhat brighter.....*perihirta* Ckll.

Thornloe, Ont.; Cochrane, Ont.; Athabaska, Alta.; Lethbridge, Alta.; Invermere, B.C.; Penticton, B.C., Keremeos, B.C. and Victoria, B. C. Specimens from the interior valleys of Southern British Columbia are almost indistinguishable from those of *latimanus* Say.

Next in importance to the species of the *latimanus* group in the pollination of alfalfa is *Megachile calogaster* Ckll., a variety of, or closely related to *M. melanophæa* Sm. *M. calogaster* has no white felt bands at the apices of any of the abdominal segments, and segments 3 to 5 are black haired. The female has a bright red pollen brush, and the fore tarsi of the males are dilated and pale as in the *latimanus* group. It is common in Southern Alberta and Southern British Columbia, flying from about the middle of June until about the end of July, that is two or three weeks earlier than those of the *latimanus* group. It is found on many flowers besides alfalfa.

NEW SPECIES OF RHODITES FROM OREGON.

BY WILLIAM BEUTENMULLER, NEW YORK.

Rhodites oregonensis, sp. nov.

Female.—Head black, coarsely rugoso-punctate and finely pubescent. Antennæ 14-jointed, black. Thorax jet black, shining, minutely rugose with larger punctures, pubescent. Parapsidal grooves continuous, very distinct, and moderately widely apart at the scutellum. Median groove distinct, gradually becoming finer forwardly, especially between the anterior parallel lines, and practically lost at the collar. Anterior parallel lines fine and close to the median groove. Lateral groove very fine and scarcely defined. Pleuræ finely rugose with a large, smooth, polished area. Scutellum subopaque, black, finely and evenly rugose, basal fovea wanting. Abdomen rufous, terminal segment blackish, microscopically punctate on the dorsal half of the last four segments, lower half and basal segments smooth. The punctured segments are clothed with yellowish decumbent hairs at their bases laterally, ventral sheath black, plough-shaped and extending beyond the last segment. Dorsum and venter rather sharply keeled with the sides moderately rounded. Legs rufous, tarsi dark brown-black. Wings yellowish, hyaline, veins dark brown and stout, transverse veins, slightly infuscated. Radial area closed, cubitus not continuous. Areolet large. Length 4.50 mm.

Gall.—(Plate, IX, Figs. 1–6). On the tip of the twigs or in the seed-pods of *Rosa nutkana*. Monothalamous. Red, smooth, elongate or subspindle-shaped with the apex rather sharply pointed and broader at the base, sometimes with the apex more or less rounded. It is an elongated malformation of a bud. Larval chamber large and situated at the base of the gall. (Figs. 1–4). When in the seed-pod the gall is somewhat like the kernel of a wheat or oat, and is densely covered with short, hairy filaments. The entire seed-pod, as a general rule, is completely filled with galls, closely packed together, sometimes causing the pod to burst open when the galls therein reach maturity. (Figs. 5–6.)

Habitat.—Corvallis, Oregon, (B. G. Thompson).

It is a very distinct species allied to *Rhodites rosæ*, *nodulosus* and *verna*. There are no differences between the flies I bred from

the twig galls from those in the seed-pods. The galls were sent to me in February, 1917, and the flies began to emerge indoors from February 28th until late in March. I also received galls in July collected by Mr. Thompson, who deserves credit for discovering this interesting new species as well as the three following species.

Rhodites ashmeadi, sp. nov.

Female.—Head black, finely and evenly granulate. Antennæ black, 14-jointed. Thorax black, very slightly shining, minutely granulate, with larger punctures. Parapsidal grooves fine and sharply defined, running almost parallel from the collar to the scutellum where they suddenly curved inwardly but are rather widely apart at this point. Median groove fine, and running from the scutellum to about the ends of the anterior parallel lines and are obliterated anteriorly. Anterior parallel lines very fine and scarcely evident, and widely separated. Lateral grooves exceedingly fine. Scutellum opaque, very finely and evenly rugose, granulated not more so than the thorax, basal fovea wanting. Pleuræ black, finely granulated with a smooth, polished area. Abdomen rufous, terminal segments and dorsum darker, terminal segments, punctate, and with short, yellowish, decumbent hairs, and more sharply keeled than the basal segments. Ventral spine not extending beyond the last segment. Wings dusky hyaline, radial cell yellowish brown and a small cloud beyond. Radial area closed. Cubitus continuous. Areolet distinct. Length 3–3.50 mm.

Gall.—(Plate IX, Figs. 7–10). On the stems of *Rosa nutkana*. Polythalamous. A hard, fusiform swelling of the twig varying from 12–30 mm. in length, and from 4–7 mm. in width. It is hard and woody like the stem and has numerous cells inside. (Fig. 7.) Externally it is red and smooth like the stem.

Habitat.—Corvallis, Oregon. (B. G. Thompson).

The galls were received from Mr. B. G. Thompson early in February, 1917, and the flies emerged from the latter part of this month until April 7th, 1917. Named in honor of the late Dr. W. H. Ashmead, who helped me so much in my studies of the Cynipidæ.

Rhodites ostensackeni, sp. nov.

Female.—Head black, roughly and evenly rugose. Antennæ 14-jointed, 3rd joint very long, following joints considerably shorter and subequal. Thorax black, highly polished, sparsely punctate but densely so between the parapsidal grooves at the scutellum, and with scattered, minute, yellowish hairs. Parapsidal grooves very distinct, deep and finely punctate. Median groove fine and continuous. Anterior parallel lines indistinctly evident. Lateral grooves short and distinct. Pleuræ finely rugoso-punctate without a smooth, shining area. Scutellum opaque, finely rugose, basal fovea wanting. Abdomen black or piceous, subglobose, microscopically punctate from the fourth to last segments, basal segments smooth. Ventral spine stout, extending slightly beyond the last segment. Legs rufous. Wing hyaline, clouded with yellowish brown in the radial cell and a little beyond. Veins dark brown. Radial area open at the costa. Cubitus continuous. Areolet large. Length 3–3.75 mm.

Gall.—(Plate IX, Figs. 11, 12). On the roots of *Rosa nutkana.* Polythalamous. Irregularly rounded and composed of confluent nodules, and is more or less irregularly grooved. At the place of attachment it is on a short stalk, and the gall may be easily removed. Inside are numerous hard larval cells firmly imbedded in the pithy substance. It looks very much like a miniature gall of *Rhodites radicum.* Width 12–17 mm. Height 10–15 mm.

Habitat.—Corvallis, Oregon. (B. G. Thompson).

A distinct species allied to *Rhodites utahensis* and *R. radicum.* The galls were sent to me by Mr. Thompson early in February, and the flies began to emerge about March 30th and early in April. Named in honour of the late R. von Ostensacken, the pioneer on the work of American Cynipidæ.

Rhodites bassetti, sp. nov.

Female.—Head black, densely punctate on the face, less so on the vertex and cheeks. Antennæ black, 14-jointed. Thorax black, very densely and finely punctate, subopaque. Parapsidal grooves rather sharply defined, continuous and widely apart at the scutellum. Median groove delicate and scarcely defined

anteriorly. Anterior parallel lines very delicate. Lateral grooves fine. Pleuræ black, subopaque, rugosely punctate with a shining, smooth or almost smooth area. Scutellum black, rugose and without basal fovea. Abdomen black, smooth, shining, with the ventral sheath extending slightly beyond the tip of the abdomen. Legs rufous. Wings dusky hyaline with the cubital and radial cells yellowish brown and a slight cloud of this colour in the large terminal area. Veins brown. Radial area closed on the costa. Cubitus distinctly continuous. Areolet distinct. Length 2.50–3 mm.

Male.—Colour of the female. Antennæ 15-jointed. Wings somewhat less infuscated in the cells. Length 2–2.75 mm.

Gall.—(Plate IX, Figs. 13, 14). On the tips of the twigs of *Rosa nutkana*. Polythalamous. A rounded, hard and woody gall densely covered with long, green filaments forming a moss-like mass as in *Rhodites rosæ*, and strongly concave at the place of attachment. Diameter 17–38 mm.

Habitat.—Corvallis, Oregon. (B. G. Thompson).

A number of galls of this species were sent to me by Mr. B. G. Thompson, collected December 10th, 1916. At first I considered them to be *Rhodites rosæ* Linn. But when the flies began to emerge (indoors) during the latter part of February until about the middle of March, I found that they were different from *R. rosæ* in sculpture and colour. The gall, although similar externally to *R. rosæ*, differs by being more woody inside and strongly concave at the place of attachment, being almost like an inverted cup or bowl in shape, while the gall of *R. rosæ* is composed of an agglomeration of hard cells around a branch. Named after the late Homer F. Bassett.

Explanation of Plate IX.

Figs. 1– 4 *Rhodites oregonensis* Beutm., on tips of branches.
Figs. 5– 6 " " in seed-pods.
Figs. 7–10 " *ashmeadi* Beutm.
Figs. 11–12 " *ostensackeni* Beutm.
Figs. 13–14 " *bassetti* Beutm.

GALLS OF NEW SPECIES OF RHODITES.

See p. 308.

A NEW NORTH AMERICAN SPECIES OF ANTHOMYIIDÆ (DIPTERA).

BY J. R. MALLOCH, URBANA, ILL.

Among some Diptera recently received from Mr. C. W. Johnson I have found several very interesting forms, some of which are evidently undescribed. One of the most striking forms is the one described herewith, which is also represented in material in my hands belonging to the U. S. Bureau of Biological Survey.

Hylemyia pluvialis, n. sp.

Male.—Black, covered with dense gray pruinescence. Antennæ and palpi black; orbits and face with silvery pruinescence. Thorax not vittate. Abdomen with an interrupted dorso-central black stripe, which is slightly dilated at anterior margin of each segment. Legs black, tibiæ entirely or in large part rufous. Wings clear.

Eyes separated by less than distance across posterior ocelli; arista with the longest hairs about twice as long as basal diameter of arista. Prealar bristle usually absent; 3 strong pairs of presutural acrostichals usually present; pleura with normal hairs and bristles. Third dorsal abdominal segments with a truncate extension at posterior lateral angle; fifth sternite with broad processes which extend almost to apex of abdomen and are armed along outer margin with a fringe of long, slender bristles which are directed downward and curve mesad at their apices.

Fore tibia with one posterior bristle above middle; third and fourth fore tarsal joints slightly dilated; mid tibia with 1–2 antero-dorsal and 2–3 postero-dorsal bristles; hind femur with 5–6 widely spaced antero-ventral bristles, and 4–5 weak postero-ventral setulose hairs on basal half; hind tibia with 3–5 antero-dorsal and 3 postero-dorsal bristles, and 5–6 antero-ventral, and 7–9 postero-ventral setulose hairs. Third and fourth wing-veins slightly convergent apically; costal thorn of moderate length.

Length 5 mm.

Type locality, Gold Rock, Ont., Rainy River District, July 21 (H. H. Newcomb).

Paratypes.—Estes Park, Moraine Park, altitude 7,500 feet, Col. (E. C. Jackson.)

Type in collection of Illinois Natural History Survey, paratypes in collection of U. S. Bureau of Biological Survey.

TWO NEW HYDROTÆAS. (DIPTERA, ANTHOMYIDÆ).

BY J. M. ALDRICH,
Bureau of Entomology, U. S. Dept. of Agriculture

The two species herein described possess the common characters of the genus,—sixth vein not reaching the margin of the wing, scutellum bare below, hind calypter projecting beyond the front one, four posterior dorsocentrals, and in the male two teeth on the underside of the front femur near tip. Males of the genus are quite easily separated by the armature of the legs, but these characters are greatly reduced or mostly absent in females, which are in several instances very difficult to distinguish. Mr. Malloch has tabulated the males for the known North American species in Bulletin of the Brooklyn Entomological Society, XI, 108, 1916, and the females in the same journal, XIII, 30, 1918. With the two herein described we have a total of 17 species, of which 9 are European.

The function of the femoral teeth which occur regularly in the males has not been observed to my knowledge. I surmise that the male grasps the front edge of the wing of the female with the femur and tibia during copulation; while this is merely a theory, it is offered as a stimulus to observation.

Hydrotæa orbitalis, n. sp.

Male.—General colour deep black, only the abdomen noticeably pollinose. Eyes bare, separated on the front by about two-thirds of the space between the hind ocelli, the black median stripe distinct to ocelli, orbits very narrow, widening close to the antennæ, shining black to the level of the arista, below this like the flat facialia they are thinly brown pollinose; lunule white pollinose; antennæ black, of ordinary size, arista bare; palpi and proboscis black. Thorax subshining black above, more opaque black anteriorly, with no stripes; pleuræ wholly shining except a space above hind coxæ, which with the postnotum is thinly brown pollinose. Prealar wanting; two or three pairs of anterior acrostichals in rows close together, a few very delicate hairs barely visible

between them; halteres with black knob; calypters yellow. Abdomen ovate, above with somewhat changeable pollen with a rather bluish cast, showing an indistinct median black stripe. Legs black, front femora with the usual two teeth below near tip, the outer bearing four small spines on its outer side, with which several longer bristles near the base form a widely interrupted row; front tibia without bristles except at apex; middle femur with long, soft hairs on front and hind sides, a few more bristle-like in front on basal half, middle tibia with no bristles on outer front side in one specimen, in the other with one very small, and in both with two behind; hind femur on outer side with complete upper and lower rows of bristles, both nearly horizontal, and numerous hairs below on inner side, some of which beyond middle are bristly; hind tibia with one long bristle behind below middle, a complete row of cilia on outer hind side including one bristle below the middle, a row of cilia on apical half of outer front side, and on inner front side for the middle third a loose row of erect, slender hairs of which the uppermost are one-half longer than the thickness of the tibia; at the tip of the hind tibia on the inner side is a row of a dozen close-set little spines forming a small comb, which stands in a diagonal position. Tarsi of ordinary form, the pulvilli not much elongated. Wing brownish, narrow, third and fourth veins a little convergent, last section of fourth more than twice the preceding.

Length 6 mm.

Female unknown.

Two males: the type is from Lafayette, Ind., June 20, 1916; paratype Moscow, Idaho, June 19, 1910, taken on parsnip flowers. Both collected by the writer. The type will be deposited in the National Museum.

In Malloch's table the species runs to couplet 10, and of the remaining species is nearest related to *bispinosa* Zett., which, however, has a strong bristle on outer front side of middle tibia, and lacks the peculiar hairs on the inner front side of the hind tibia.

Hydrotæa comata, n. sp.

Male.—Deep black, subshining, abdomen only faintly pollinose. Eyes bare, separated at middle of front by about the dis-

tance between hind ocelli; frontal stripe extending to ocelli; orbits very narrow, widening below, shining black to below level of arista, then thinly brown pollinose; facialia and lunule more densely brown pollinose; antennæ black, of ordinary size, arista bare, its penultimate joint longer than wide; palpi and proboscis black; postorbital cilia long, slender, curling over the eye. Thorax shining black, unstriped, only the postnotum and a space above the hind coxa with thin, brown pollen; prealar indistinguishable among some long hairs, several pairs of long, erect anterior acrostichals mixed with slender, tall hairs; mesopleura and sternopleura with abundant long hair, the two stpl. bristles of striking length; halteres blackish, calypters deep yellow. Abdomen rather elongate, shining black, only when viewed from behind showing a thin, dark pollen with a median dark stripe. Legs wholly shining black; front femora with the usual two teeth below, and abundant hairs on outer side, among which below about five bristles form a short row; front tibiæ broadly flattened and corrugated on the inner side opposite the femoral teeth, without bristles except at tip; middle femora on front side with short, erect, dense hairs, on hind side with immensely long hairs, some 2/5 as long as the femur; middle tibia on outer front side with four slender bristles beyond middle, the subapical long and hairlike; on the outer hind side with four bristles, and on inner hind side close to tip with half a dozen smallish, hairlike bristles; middle basitarsus with unusually long hairs below, which are longer apically and continue but slightly reduced to the tip of the following joint; hind femur below at base with a stout, erect double spine with crooked tip; on the outer side the upper series of bristles is complete and the lower begins at the middle; hind tibia with striking rows of long villous hairs or bristles on the outer and inner flexor sides, the outer especially long, some of them 2/5 as long as the tibia; a distinct bristle just below the middle behind, and on the outer hind side a series of long hairs in which two bristles occur. Pulvilli dark, not elongated.

Wings brownish, third and fourth veins barely convergent; last segment of the fourth less than twice the preceding.

Female.—Shining black, including abdomen. Front one-third the head-width, velvet black except the large, shining ocellar

triangle, which stops just short of the cruciate bristles, and the shining orbits, which become very wide near the antennæ, where together they exceed the stripe; thorax with the hairs not unusually developed; two pairs of large, anterior acrostichals with hairs between and before; prealar distinct, more than one-third as long as following bristle; two sternopleurals behind, the lower smaller, and one in front. Front tibia with one or two very minute bristles in front; middle tibia with three on outer front beyond middle, four on outer hind; hind tibia with one long behind, three on outer hind, three on outer front; middle tarsi normal; middle femur with a row of short bristles on front side, ending abruptly at middle, no unusual hairs behind. Calypters as in male, halteres more brown than black.

Length of male 7.2 mm.; of female 6.4 mm.

One male, one female, collected at Tacoma, Wash., on June 27, 1917, by Professor A. L. Melander, to whom they are returned.

The male runs to *occulta* in Malloch's table, from which it differs in many charaters, among them the presence of dense hair below on the first two joints of the middle tarsus. The female hardly runs at all in Malloch's table, as the halteres are intermediate between yellow and black, the first alternative; it separates from all other species in large size, wide shining, black orbits, and the armature of the middle tibiæ.

OBITUARY.

Lieut. Vernon King.

We regret to record the death of Lieut. Vernon King of the Royal Flying Corps, who was killed in France on April 11th, 1918.

Lieut. King was a graduate of the Ontario Agricultural College, Guelph, and before enlisting was a Scientific Assistant in the Branch of Cereal and Forage Insect Investigations of the Bureau of Entomology, U. S. Dept. of Agriculture. He resigned his position in November, 1914, and proceeded to England. After serving at the Dardanelles he joined the Flying Corps and was killed in an air fight while carrying on duties as an observer on the date mentioned. He was an extremely promising young man, and was very well liked by all who knew him.

PARTIAL KEY TO THE GENUS AGROMYZA (DIPTERA). FOURTH PAPER.

BY J. R. MALLOCH, URBANA, ILL.

The key presented in this paper contains species with the following characters:

Frons partly reddish or yellow, either the interfrontalia or orbits or both entirely or in part pale; scutellum not noticeably paler than dorsum of thorax; costa extending to apex of fourth vein; halteres whitish or yellowish.

I believe that the species I described as *coloradensis* in October, 1913, is the same as that described by Melander, a week or two before the appearance of my paper, under the name *genualis*. The descriptions agree so clearly that I have indicated the synonymy in the present paper.

I have included *aceris* Greene in this key although I cannot tell definitely from the description whether the frons is partly red in front or not. The species is closely related to *pruinosa* with which it is compared in the key. There are several species closely related to these two, including *pruni* Grossenbacher, and *waltoni* Malloch, the arbitrary characters used in the keys being responsible for their occurrence in different papers in this series. All of the cambium-mining species I have examined have the orbits poorly or not at all differentiated from the interfrontalia, the thorax with very dense pruinescence, and 4 pairs of dorso-central bristles.

1. Mesonotum opaque gray; centre of disc between the rows of dorsocentrals with a yellowish brown longitudinal vitta which extends on to the disc of scutellum; 4 pairs of dorsocentrals present. Food-plant unknown. N. H.; Mo.; Ill.; N. M.; B. C. ..... *immaculata* Coquillett.
   Mesonotum shining, or if opaque gray then without a
   Mesonotum shining, or if opaque gray then without a brown longitudinal vitta 2
2. Antennæ entirely yellow or reddish, the third joint occasionally slightly darkened at insertion of the arista 3
   At least the third antenal joint black 10
3. Pleuræ most yellow 4
   Pleuræ black, at most the sutures yellowish 6

4. Lateral margins of mesonotum concolorous with disc; pleuræ entirely yellow. Food-plant unknown. Ill.....*pleuralis* Malloch.
Lateral margins of mesonotum yellow; pleuræ with dark marks.....5

5. Very small species, 1 mm. in length; frons subquadrate; mesonotum with 3 pairs of dorso-centrals. Food-plant unknown. Wash.....*clara* Melander.
Larger species, 1.5 mm. in length; frons longer than broad; mesonotum with 4 pairs of dorso-centrals. Food-plant unknown. Cal.; Maine.....*citreifrons* Malloch.

6. Lateral margins of mesonotum pale yellow.....7
Lateral margins of mesonotum concolorous with disc.....8

7. Last section of fifth vein subequal to preceding section. Food-plant unknown. Alaska.....*pollinosa* Melander.
Last section of fifth vein twice as long as preceding section. Food-plant unknown. N. M.....*indecisa* Malloch.

8. Legs entirely black; frons reddish in front, blackish behind; thorax densely gray pruinescent, with 4 pairs of dorso-centrals; outer cross-vein at its own length from inner. Larvæ mining in cambium of *Amelanchier canadensis*. W. Va.....*amelanchieris* Greene.
Legs with the knees at least pale, either reddish or yellow....8a.

8a. Large, robust species, at least 4 mm. in length; orbits poorly or not at all differentiated from interfrontalia; thorax with 4 pairs of dorso-central bristles.....8b.
Smaller, slender species, at most 3 mm. in length; orbits well differentiated from interfrontalia; thorax with 2, rarely 3, pairs of dorso-central bristles.....9

8b. Palpi reddish yellow; first costal division not over two-thirds as long as second; last section of fifth vein subequal to penultimate section. Larvæ mining in cambium of *Betula niger*. Col., Va., Ill.....*pruinosa* Coquillett.
Palpi black; first costal division about three-fourths as long as second; last section of fifth vein distinctly longer than penultimate section. Larvæ mining in cambium of *Acer rubrum*. Va.....*aceris* Greene.

9. Last section of fifth vein 1 1/3 times as long as preceding sec-

tion first costal division (that beyond humeral vein) over half as long as second; interfrontalia entirely reddish; orbital and dorso-central bristles weak; proboscis and palpi fuscous; food-plant unknown. Ill.....*albidohalterata* Malloch.

Last section of fifth vein subequal to preceding section; first costal division half as long as second; interfrontalia infuscated on upper half; orbital and dorso-central bristles strong; proboscis and palpi orange-coloured. Food-plant unknown. D. C., Pa., Ill.....*varifrons* Coquillett.

10. Lateral margins of mesonotum broadly pale yellow..... 11

Lateral margins of mesonotum narrowly, or not at all, yellow, the pale colour confined almost entirely to the suture or to the extreme upper margin of the pleuræ.....12.

11. Frons with the centre stripe pale yellow; orbits sometimes blackened posteriorly; legs black, knees never yellow. Larvæ mining leaves of *Malva*, *Verbena*, *Solidago*, *Helianthus*, *etc.* General.....*jucunda* V. d. Wulp.

Frons with centre stripe more or less blackened; legs with knees pale yellow. Larvæ mining leaves of oats, wheat and other cereals. General.....*coquilletti* Malloch.

12. Palpi yellow. Food-plant unknown.

General.....*longipennis* Loew.

Palpi black.....13.

13. Lengs entirely black..... 13.

Legs in part yellow.....15.

14. Shining black species, very slightly dusted; interfrontalia yellow; thoracic bristles very long; 4 pairs of strong dorso-centrals; last section of fourth vein three times as long as preceding section. Food-plant unknown.

Mont.....*rutiliceps* Melander.

Opaque black, pollinose species; thoracic bristles distinct from setulæ; abdomen entirely black; frons reddish anteriorly, black posteriorly. Larvæ mining in cambium of *Amelanchier canadensis*. W. Va.....*amelanchieris* Greene.

Opaque black, pollinose species; interfrontalia yellow; thoracic setulæ long, dorso-centrals scarcely distinguishable from them except the posterior pair; last section of fourth vein

4 times as long as preceding section. Food-plant unknown. Id.....*auriceps* Melander.

15. Small species, 1.5–2 mm. in length; general colour shining black, interfrontalia black; orbits lemon yellow on upper half; apical half of femora yellow; tibiæ brownish yellow. Food-plant unknown. Mass., D. C., Ind., Ill.....*marginata* Loew.

Larger species, 2.5–3.5 mm. in length; general colour opaque black, gray pollinose; interfrontalia and orbits largely or entirely yellow; femora narrowly yellow at apices. Food-plant unknown. Mont., Id., Wash., Col., Maine.....(*coloradensis* Malloch) *genualis* Melander.

OUR BIRCH *SYMYDOBIUS* DISTINCT FROM THE EUROPEAN. (APHIDIDÆ—HOM.)

BY A. C. BAKER, WASHINGTON, D.C.

In 1909 specimens of the oviparous female of a species of *Symydobius* were collected from birch by the writer at Puslinch Lake near Guelph, Ont. These were determined as *oblongus* Heyden. Dr. Edith M. Patch* found the same species in Maine in 1908 and gave an excellent description and figures of it under the name *oblongus*. Specimens collected in 1903 on *Betula alba* in Minneapolis, Minn., presumably by Mr. Theo. Pergande, are now in the collection of the Bureau of Entomology. A study of the different specimens available has led the writer to conclude that our American form is quite a distinct species.

Specimens of *S. oblongus* taken in Petrograd by Chlodkovsky, in Warsaw by Mordwilko, and in Brussels by Schouteden, all agree in characters, and these are uniformly different from our American species.

In the alate form the most striking difference is met with in the relative lengths of the antennal segments. This will be seen from the following measurements of *oblongus* as compared with the description of the American species given herewith.

S. oblongus III, 1.12 mm.; IV, 0.72 mm.; V, 0.528 mm.; VI, (0.208 mm.+0.112 mm.).

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*Me. Agr. Exp. Sta., Bull. 181.

It will be seen by these measurements that the unguis of segment VI is much shorter than the base and only about one-tenth as long as segment III. In the American species on the other hand the base and the unguis of segment VI are almost equal, and the unguis is about one-fourth as long as segment III. In the American species also the anal plate is somewhat indented, whereas in the European species this is not noticed.

The apterous forms show the same differences between the two species in regard to segment VI of the antennæ, the European species measuring III, 1.168 mm.; IV, 0.72 mm.; V, 0.512 mm.; VI, (0.144 mm.+0.112 mm.). Another difference between the two species in this form is that in the American species segment III is armed with a row of sensoria which cover the entire segment, whereas in *oblongus* only the basal half of the segment is covered. There is this same difference also in the alate forms, but a little more than half of segment III is covered in *oblongus*.

Symydobius americanus, n. sp.

Alate viviparous female.—Antennal segments as follows: III, 0.96 mm.; IV, 0.64 mm.; V, 0.528 mm.; VI, (0.224 mm.+0.24 mm.). Segment III with a row of about 25 rather small protruding sensoria arranged in a more or less even row over the entire segment. Hind tibiæ 1.28 mm., hind tarsus 0.192 mm.; hind wing about 3 mm. long, cauda rounded, anal plate slightly notched.

Colour brown, abdomen with dark transverse bands, cornicles pale, wing veins heavily bordered with dark brown; antennæ with segments I to III and the distal extremities of IV, V and VI dark brown, the remainder yellowish white.

Apterous viviparous female.—Antennæ as follows: III, 1.15 mm.; IV, 0.72 mm.; V, 0.592 mm.; VI, (0.24 mm.+0.24 mm.). Segment III, armed with about 20 circular sensoria in a somewhat even row along the segment. Hind tibiæ somewhat curved, about 2.88 mm. long; hind tarsus 0.224 mm. Cauda and anal plate similar to those of the alate form. Length from vertex to tip of cauda 2.88 mm.

Colour brown. Antennæ and cornicles similar to those of the alate form. Abdomen with transverse brown markings. Eyes red.

Oviparous female.—Antennæ as follows: III, 0.928 mm.; IV, 0.512 mm.; V, 0.416 mm.; VI, (0.208 mm.+0.24 mm.). Segment III armed with sensoria as in the apterous viviparous female. Hind tibiæ 1.44 mm. long; slightly swollen and armed with a very large number of rather small, indistinct sensoria; hind tarsus 0.224 mm.; caudal extremity somewhat drawn out into an ovipositor though not prominently so.

Colour as in the apterous viviparous form.

Described from specimens in balsam mounts.

Type in U. S. Nat. Museum.

The two species may be separated by means of the following characters:

A. Unguis of segment VI considerably shorter than the base and about one-tenth as long as segment III; sensoria on segment III on basal half only.....*oblongus*.

B. Unguis of segment III about equal to base and about one-fourth as long as segment III; sensoria on segment III in a row covering entire segment.....*americanus*.

HOW EMPHOR DRINKS.

BY CHARLES ROBERTSON, CARLINVILLE, ILLINOIS.

The fact that *Emphor bombiformis* rests upon the water when drinking, mentioned under the above title by Frederick Knab in Proc. Ent. Soc. Washington, Vol. XIII, p. 170, 1911, was observed in 1890 and was recorded in the Canadian Entomologist, Vol. XXII, p. 217. It is fairly certain that the bees were not drinking in the ordinary sense, but that they consisted exclusively of females which were getting water to soften the earth in which they were making excavations for their nests.

Mailed September 10th, 1918.

The Canadian Entomologist.

Vol. L. LONDON, OCTOBER, 1918 No. 10

POPULAR AND PRACTICAL ENTOMOLOGY.

The Fruit-tree Leaf-roller (Tortrix argyrospila).

BY L. CAESAR, GUELPH, ONT.

It is only during the last five or six years that the Fruit-tree Leaf-roller has been known as a dangerous pest in apple, pear or plum orchards in Ontario. It has evidently, however, been present in the province for many years, for otherwise the writer would not have been able the second year of the outbreak to find it here and there in small numbers in almost every fruit-growing district of the province.

Up to the present time only three bad outbreaks have been discovered, and these all occurred almost simultaneously about six years ago. One of these was in a ten-acre orchard in the county of Northumberland, another in a larger orchard in the county of Wentworth, and the other in a still larger orchard in the county of Norfolk. The history of the insect in each of these three orchards may prove of interest and possibly of some value.

The first two years in all three orchards much damage was done, and the owners estimated that from 20% to 60% of the fruit was ruined. In the third year the insect began to decrease in number in both the Northumberland and Wentworth orchards, and has now almost disappeared from them. In the Norfolk orchard there was also a decrease in the third year and comparatively little injury since until this year, when a large portion of the orchard is once more severely attacked. All surrounding orchards in each of these localities have remained practically free from the pest. This shows clearly its remarkable tendency to localize itself and remain almost exclusively in its chosen abode.

The owners of the respective orchards endeavored on the writer's suggestion to control the insect by very heavy applications of arsenate of lead just before the blossoms opened and again immediately after they fell. After the second season it was seen that arsenicals would not control it, and following the experience

of experimenters in the United States scalecide (a miscible oil) was used both in the Wentworth and Norfolk orchards. Fairly good results were obtained in both orchards, but as this mixture is costly it was used only one season in the Wentworth orchard and two seasons in the Norfolk one. It was then thought that natural agents would probably furnish the work of control and that the insect would gradually disappear. This proved true in the case of the Wentworth orchard just as it had done in the Northumberland, but failed in the Norfolk. It is interesting, therefore, to know that in one locality, even apart from any effective spray, natural foes—parasites, disease and unfavourable weather—were able in a few years to remove or control a very dangerous pest, and that in another district they failed to do so even though aided by an application of one of the most effective sprays known. The explanation probably lies in the fact that there is considerable difference in climate in winter, spring and autumn between Norfolk and Northumberland Counties, and also to a lesser extent between Norfolk and Wentworth Counties. Our studies in Norfolk showed that there were at least two species of dipterous parasites there and four or five species of hymenopterous parasites; so that the persistence of the Leaf-rollers there was not due to the absence of parasites, though cooler weather during the larval stages of the insect may have prevented the parasites from being so active as in the other orchards. This, however, is by no means certain.

Lest fruit growers finding a few rolled leaves with greenish or yellowish green larvæ in them become alarmed and think that they are going to have an attack of this dangerous pest, we may mention that there is another very common Leaf-roller, known as the oblique-banded Leaf-roller which occurs almost every year in small numbers in almost every orchard. The larva of this species is not easily distinguished from its more dangerous relative and, therefore, may easily be mistaken for it. The adult moths, however, are easily distinguished. The proper course in our opinion for fruit growers to pursue is not to worry about the Fruit-tree Leaf-roller until it is known to be present in the orchard and to be doing considerable damage—enough damage to justify special measures. When this state of affairs exists spray the trees very

thoroughly with scalecide or some other good miscible oil a few days before the buds burst. This substance will kill all the eggs that it covers, but to insure that the egg masses are all covered means that the spray must be forced right through the tree to the farthest twigs and branches on the opposite side, otherwise many egg masses situated on the inner side of these twigs and small branches will not be hit. The introduction of the new spray guns makes it a great deal easier to control these insects than it was a few years ago. It should be remembered that each barrel of scalecide should be diluted enough with water to make sixteen barrels of mixture for the orchard, and also that this substance is very effective against San José scale. In nearly every case the scalecide should be used two years in succession to insure full success.

NOTES ON COCCIDÆ II. (HEMIPTERA).

BY G. F. FERRIS, STANFORD UNIVERSITY, CALIFORNIA.

As at present constituted, the genus *Sphærococcus* is nothing more than a convenient dumping-place for a considerable number of species that are but little understood—or it were entirely truthful to say not understood at all. The only character that the eighteen or twenty included species are supposed to have in common is that of the absence of hairs on the anal ring. I am informed by Mr. Harold Morrison, who has examined the types of *S. casuarinæ* Maskell, (the type of the genus), that setæ are present on the anal ring of this species, notwithstanding Maskell's assertion to the contrary. In fact, Mr. Morrison is somewhat inclined to believe that this species is nothing more than a species of *Antonina* and certainly the original description and figures support this conclusion. However that may be, some of the species now referred to this genus indubitably have nothing to do with the genotype and must be placed elsewhere. It is probable that but few of these can be assigned to recognized genera.

I am here naming new genera for three of the species now included in *Sphærococcus*. One of these, based upon *S. pulchellus* Maskell, belongs to the group now recognized as the tribe *Asterolecaniini* of the subfamily Dactylopiinæ. The other two, based

upon *S. cupressi* Ehrh. and *S. disticlium* (Kuwana), appear to belong to an unnamed group that includes *Kuwanina parvus* (Maskell) also. I consider this group to be equivalent in value to the groups at present recognized as tribes of the subfamily Dactylopiinæ. Whatever that value may be is certainly questionable for this subfamily, like the genus *Sphærococcus*, is a most unnatural and but little understood group that must eventually be disrupted and reorganized. Pending this upheaval I shall not name the group under consideration, but shall merely indicate as many of its characters as appear to be of value. The group may be characterized as follows:

Coccidæ referable to the subfamily Dactylopiinæ (of the Fernald Catalogue), that is: without abdominal spiracles; end of the abdomen neither cleft nor pygidiform; without a pair of conspicuous lateral prominences. Distinguishable from the other groups of the subfamily chiefly by negative characters. Without dorsal ostioles or cerarii; anal lobes obsolete; without 8-shaped pores; tubular ducts without a filamentous prolongation but bearing at their inner extremity a more or less definitely multilocular pore; anal ring nearly or quite simple, with from two to six very small setæ; antennæ either well developed or vestigial; legs either entirely lacking or well developed.

Included genera: *Kuwanina* Ckll.; *Ehrhornia* new genus; *Paludicoccus* new genus.

KEY TO INCLUDED GENERA.

1. Adult female with well developed legs and antennæ, the latter 6-segmented.....*Ehrhornia*, n. gen.
   Adult female without legs and with vestigial antennæ, the latter not more than 3-segmented.....2.
2. Adult female with a pair of small, circular cribriform plates on the ventral side of the abdomen.....*Kuwanina* Ckll.
   Adult female without cribriform plates.....*Paludicoccus*, n. gen.

Kuwanina Ckll.

1903. Cockerell, T. D. A., in Fernald, Cat. Coccidæ, p. 101.

Coccidæ of the type described above. Adult female apodous and with the antennæ reduced to mere unsegmented tubercles.

Ventral side of the abdomen with a pair of small, circular, cribriform plates. Dermal pores quinquelocular, somewhat pentagonal in form. Anal ring appearing on the ventral side in the adult female, small, simple, with six small setæ. First stage larvæ with 3-segmented antennæ.

Type of the genus, *Sphærococcus parvus* Maskell.

Notes.—The original description of this genus consists merely of a quotation from a letter by Cockerell to the effect that, "Kuwanina differs from Antonina by the larva having 3 or 4-jointed antennæ." It is rather difficult to understand why the genus was compared with *Antonina* rather than with the type of the genus from which it was removed.

Kuwanina parvus (Maskell).

1897. *Sphærococcus parvus* Maskell, Ent. Mon. Mag., vol. 33, p. 244.

1897. *Sphærococcus parvus* Mask.; Maskell, Trans. N. Zealand Inst., vol. 30, p. 247, pl. 27, figs. 9-11.

1902. *Sphærococcus parvus* Mask.; Kuwana, Proc. Calif. Acad. Sci, ser. 3, vol. 2, p. 56.

1903. *Kuwanina parvus* (Mask.); Ckll., in Fernald, Cat. Coccidæ, p. 121.

1915. *Kuwanina parvus* (Mask.); Green, Ent. Mon. Mag., vol. 51, p. 181, figs.

There is little to add to the description given by Green, other than to note that the pores are borne at the inner end of short ducts and that the derm of the abdomen presents a curiously roughened appearance. I have examined specimens from the material recorded by Kuwana in 1902. Mr. Morrison has sent me sketches made from the type of the species and these leave no doubt as to the correctness of the determination.

Ehrhornia, n. gen.

Coccidæ of the type described above. Adult female with well developed legs and antennæ, the latter 6-segmented. Ventral side of the abdomen without cribriform plates. Dermal pores for the most part circular and without distinct loculi. Anal ring appearing on the ventral side in the adult female, small, simple

and with from two to six small setæ. Larva with 6-segmented antennæ.

Type of the genus; *Sphærococcus cupressi* Ehrh. The genus includes also a second species, herein described as *E. graminis*, n. sp. The genus is named in honour of Mr. E. M. Ehrhorn.

Ehrhornia cupressi (Ehrh.)

1911. *Sphærococcus cupressi* Ehrhorn, Can. Ent., vol 43, p. 277, figs. 3, 3 a, b, c.

This species will be redescribed at length in a forthcoming paper by Mr. F. B. Herbert, of the Bureau of Entomology, and I shall merely note that the original description is in error in regard to the statement that the anal ring is hairless. The anal ring has six small setæ.

Ehrhornia graminis, n. sp.

(Fig. 12.)

In life.—Occurring in cracks and beneath scales on the root stock of the host; of a bright yellow colour; surrounded by more or less flocculent secretion.

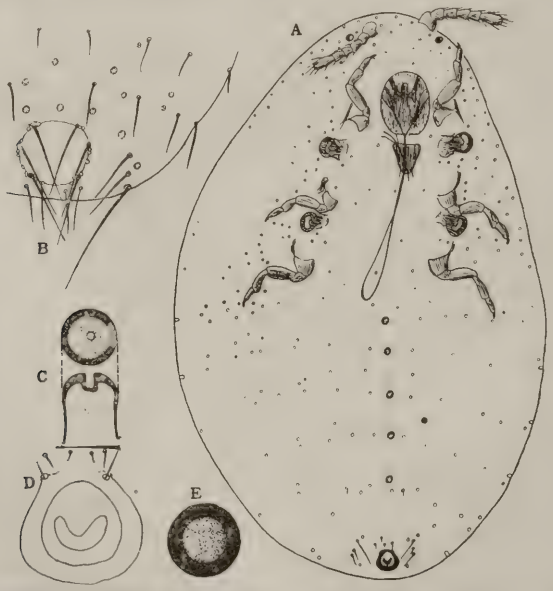

Fig. 12.—*Ehrhornia graminis*, n.sp.: A, female in last instar but not fully grown; B, posterior end of abdomen of first stage larva; C, dermal pore; D, anal ring of adult; E, large pore of the median ventral series.

Morphological characteristics.—Length of largest specimen (flattened on slide) 2.8 mm. Mounted specimens pyriform or circular. Adult female with well developed legs and with 6-segmented antennæ, the last segment longest. Derm membranous throughout except for some irregular chitinization in old individuals. Anal ring (in specimens flattened on the slide) appearing on the ventral side of the body, in old individuals at some distance from the posterior margin, quite small, heavily chitinized, non-cellular, bearing 2 small setæ. Body destitute of all but a very few extremely minute setæ and three slender setæ on each side of the anal ring. Dermal pores quite numerous, all circular, the majority borne at the inner end of short ducts. On the ventral side of the abdomen there is a median, longitudinal row of five quite large, sessile pores.

First stage larva with six-segmented antennæ. Body beset with many slender setæ, especially toward the posterior end. Anal ring simple, bearing six long setæ. Anal lobes lacking. Dermal pores numerous, circular, multilocular or occasionally trilocular.

Type host and locality.—From an undetermined species of perennial grass growing on the ridge about a mile east of the reservoir at Pacific Grove, Monterey County, Calif., Dec. 1, 1917. Collected by the author.

Paludicoccus, n. gen.

Coccidæ of the type described above. Adult female apodous and with the antennæ reduced to mere stubs, three-segmented. Ventral side of the abdomen without cribriform plates. Anal ring quite heavily chitinized, normally with 6 small setæ. Dermal pores circular and without distinct loculi. First stage larva with 6-segmented antennæ. Adult male apterous; antennæ 8-segmented.

Type of the genus; *Sphærococcus disticlium* (Kuwana).

Paludicoccus disticlium (Kuwana).

1902. *Pseudolecanium disticlium* Kuwana, Ent. News, vol. 13, p. 134, figs. 1, 2.

1903. *Sphærococcus disticlium* (Kuw.); Fernald, Cat. Coccidæ, p. 85.

The descriptions and figures given by Kuwana are in general

quite satisfactory, but there remain certain very important details that were overlooked.

The anal ring is not hairless, as was stated in the description, but bears six very small setæ. Due to the heavy chitinization of the body these are usually somewhat difficult to see. The antennæ are 3-segmented. The dermal pores are in part trilocular but the majority are circular. The circular pores are in part multilocular and sessile and in part without distinct loculi, those of the latter type being borne at the end of short ducts.

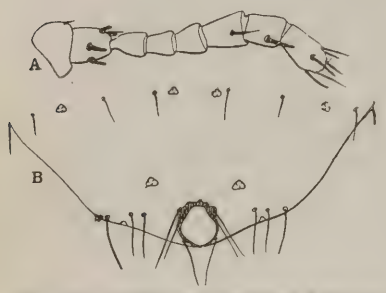

Fig 13.—*Paludicoccus disticlium*(Kuwana): A, antennae of adult male; B, posterior end of abdomen of first stage larva.

In the first stage larva the anal ring bears six slender hairs, not "four spiny hairs." The second stage differs from the adult only in the membranous condition of the derm and the smaller spiracles.

The adult male is apterous. The antennæ are 8-segmented and somewhat clavate. The body is entirely destitute of hairs except for a group of three long setæ on each side at the posterior end of the abdomen. The eyes each consist of a dorsal and a ventral ocellus, the former the larger.

Material examined.—Type and topotype specimens.

Callococcus, n. gen.

Coccidæ referable to the tribe Asterolecaniini of the subfamily Dactylopiinæ (of the Fernald Catalogue). Adult female apodous and with the antennæ reduced to mere chitinized points. Anal lobes lacking. No stigmatic clefts or stigmatic spines. Anal ring extremely obscure—apparently hairless. Pores of the 8-shaped type confined to a longitudinal row which extends along the median line of the dorsum from one end of the body to the other. Derm with many tubular ducts of the type common to the tribe, these especially numerous along the median line of the dorsum.

First stage larva without anal lobes; with the anal ring extremely minute and hairless; 8-shaped pores large, confined to the margin of the body; antennæ 4-segmented.

Type of the genus: *Sphærococcus pulchellus* Maskell.

Notes.—Although this genus appears to be unquestionably Asterolecanine it differs markedly from any other known to me. I can say nothing in regard to its relationship with the other members of the group.

Callococcus pulchellus (Maskell).

1896. *Sphærococcus pulchellus* Maskell. Trans. N. Zealand Inst., vol. 29, p. 324, pl. 21, figs. 10-13.

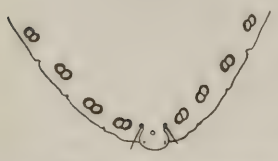

Fig. 14.— *Callococcus pulchellus* (Maskell): posterior end of abdomen of first stage larva.

The adult female of this species is enclosed in a pretty, waxy covering that has been well described by Maskell.

Morphological characteristics. — Adult female merely an elongate, oval sac, without appendages of any sort. Anal lobes entirely lacking, their position not indicated by setæ. Anal ring probably very minute and hairlesss, a it does not appear even in well stained preparations.

Derm membranes except for a narrow, somewhat irregular, longitudinal, chitinized area extending the full length of the body along the median line of the dorsum. This area appearing only in fully mature individuals. Derm with many rather short, tubular ducts, these especially numerous along the dorsal area just described. Pores of the 8-shaped type extremely minute and inconspicuous, confined to a row which extends along the median line of the dorsum from one end of the body to the other. In the fully mature insect this line of pores is almost entirely obscured by the chitinization of the dorsum.

First stage larva with 4-segmented antennæ. Anal lobes lacking, the posterior end of the abdomen pointed. Anal ring extremely minute, hairless. Derm destitute of hairs and with a single, marginal row of large, 8-shaped pores.

Material examined.—Specimens determined by Froggat as this species and agreeing in all respects with the original description.

Mycetococcus, n. gen.

Coccidæ referable to the tribe Asterolecaniini of the subfamily Dactylopiinæ (of the Fernald Catalogue). Adult female apodous and with the antennæ reduced to mere unsegmented tubercles. Body top-shaped, ending in a pair of prominent lobes, which, together with the last segment of the abdomen, are heavily chitinized.

Type of the genus: *Cerococcus ehrhorni* Ckll. *Cerococcus corticis* Towns. and Ckll., also included.

Notes.—The description here given will doubtless appear extremely short, but the characters enumerated are the only ones that the two species included have in common. Although the two are very similar in general appearance and occur upon hosts of the same genus, I am unable to avoid the conviction that they are not congeneric and perhaps should not even be referred to the same group. It has seemed best, however, to place them together until the value of the characters that seem to separate them has been more fully investigated. These differences will be discussed under the species. Neither of the species can be considered as having anything in common with the genus *Cerococcus* to which they have been referred. The first stage larvæ are very different from those of typical *Cerococcus*, the adults lack the "cauda" between the anal lobes and the cribriform plates of the latter genus while the heavily chitinized anal lobes and terminal segment of the abdomen are quite distinctive.

Mycetococcus ehrhorni (Ckll.).

(Fig. 15 A.)

1895. *Cerococcus ehrhorni* Ckll. Psyche, vol. 7, p. 255.

1901. *Cerococcus ehrhorni* Ckll.; Patterson, Proc. Calif. Acad. Sci., ser. 3, vol. 2, p. 387, pl. 22, figs. 1-9.

A sufficiently accurate general description of the insect will be found in the papers of Cockerell and Patterson, but there are certain details that have been overlooked.

The derm in the adult female bears numerous small, 8-shaped pores and a very few, extremely minute and delicate tubular ducts that appear to be of the type common to the Asterolecanine forms.

There are no trilocular pores. The anal ring appears to be very small and is entirely obscured by the heavily chitinized anal lobes.

In the first stage larva the anal ring is extremely small and appears to bear but four very minute setæ. The terminal segment is not chitinized. There are marginal and two submedian, longitudinal rows of 8-shaped pores. The antennæ are five-segmented.

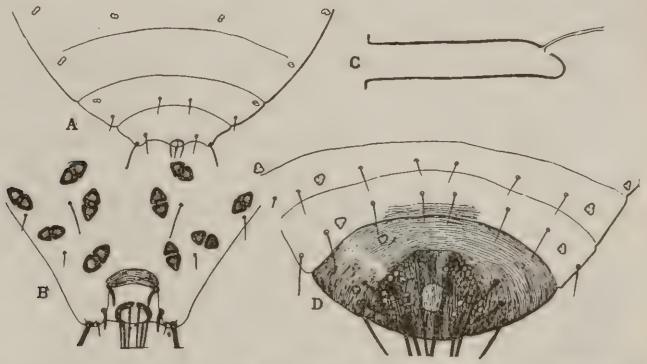

Fig. 15.—A, posterior end of abdomen of first stage larva of *Mycetococcus ehrhorni* (Ckll.); B, posterior end of the abdomen of *Cerococcus bryoides* (Maskell); C, tubular duct of *Mycetococcus corticis* (Towns. & Ckll.); D, osterior end of the first stage larva of *M. corticis*.

Mycetococcus corticis (Towns.).

(Fig. 15 C., 15 D.)

1898. *Cerococcus corticis* Towns. & Ckll., Jn. N.Y. Ent. Soc., vol. 6, p. 170.

1901. *Cerococcus corticis* Towns. & Ckll.; Patterson, Proc. Calif. Acad. Sci., ser. 3, vol. 2, p. 387, pl. 23, figs. 23-28.

As in the case of *M. ehrhorni* there are certain details that former authors have overlooked.

The derm in all stages is entirely destitute of 8-shaped pores. In the adult there are numbers of quite large, tubular ducts of a type quite unlike that usually found in the Asterolecaniinæ and, in fact, unlike any that I have seen. This peculiarity arises from the fact that the delicate filamentous prolongation of the duct arises some distance before the apex of the larger portion. The anal ring is quite large and cellular.

The first stage larva bears a few trilocular pores instead of 8-shaped pores. The anal ring is very large, heavily chitinized and

cellular and bears six large setæ. The terminal segment of the body is strongly chitinized. The antennæ are 6-segmented.

Material examined.—Specimens from the type material.

Cerococcus ovoides (Ckll.)

(Fig. 16.)

1901. *Pollinia ovoides* Ckll., The Entom., vol. 34, p. 225.

1909. *Pollinia ovoides* Ckll.; Green, Coccidæ Ceylon, pt. 4, p. 340.

The description given by Cockerell needs to be amplified at several points.

Fig. 16.— *Cerococcus ovoides* (Ckll.); dorsal aspect of anal lobes of adult female, anal ring and setae not indicated.

The adult female is in general form entirely like the other members of the genus to which I am referring the species. Legs entirely lacking. Pores of the 8-shaped type small, confined to a narrow zone extending about the body at the lateral margin. Tubular ducts abundant, small, slender, usually presenting an elbowed appearance. Two pairs of cribriform plates present, the members of each pair close together. Anal ring with 10 setæ. Anal lobes quite small, their mesal margins but slightly chitinized. Between the lobes is the characteristic "cauda" of the genus.

Cockerell states that the antennæ of the first stage larva are 6-segmented, but all the specimens examined by me show but 5 segments. The matter is not especially important as the first stage larva in other species of this genus may show either 5 or 6 segments. The 8-shaped pores of the dorsum are much smaller than those of the marginal series.

Specimens examined.—Part of the type material.

Notes.—Green has already pointed out (ref. cited) that this species appears to be close to *Cerococcus*. I am unable to find any basis for separating it generically from *C. quercus*.

SYNOPSIS OF THE GENUS TEGRODERA.

(Order, Coleoptera; Family, Meloidæ.)

BY FRANK E. BLAISDELL, SR., SAN FRANCISCO, CAL.

Recently while studying the Meloidæ in the collection of the California Academy of Science, San Francisco, a small series of ten specimens of a form of *Tegrodera* from Arizona was studied and considered worthy of a name. It is a race of *Tegrodera erosa* Lec., and its description will give an opportunity to review the genus as a whole. The species and races of *Tegrodera* have never been brought together in one paper, and the present time seems to be very opportune for so doing.

The genus *Tegrodera* was erected by Le Conte. It is characterized by having the penultimate joint of the tarsi cylindrical, the lower portion of the claws shorter than the upper and connate; the labrum is emarginate and the body glabrous.

The species and races may be separated as follows:

Elytral reticulations small and close; transverse fascia broad, subequal in width and distinct; meshes more or less pale to black.....*laticincta.*

Elytral reticulations coarse and well separated; transverse piceous fascia variable.

Transverse fascia obsolete, reduced to a subtriangular marginal blotch; meshes yellow.....*inornata.*

Transverse fascia narrow, more or less constricted at middle of each elytron, sometimes divided into a marginal and sutural subtriangular blotch; meshes piceous black.

Suture pale, sometimes blackish in basal third, meshes black.....*erosa.*

Suture black, meshes decidedly black as a rule, the black tending to diffusion.....*aloga.*

Tegrodera erosa Lec.—Head red, pronotum black or varied with red. Elytral reticulations very coarse; colour pale orange yellow with the tips always piceous for a short distance. Legs and under surface of the body black.

In the male the oblique frontal grooves and fovea of the vertex are strong; the median frontal fovea is similar in

development. The last abdominal segment is slightly emarginate at apex.

Length 16.0–27.0 mm.

Typical *erosa* is very abundant in Southern California (San Diego Co.) and Northern Lower California. It is markedly gregarious in large or small companies. In the author's boyhood days the insect was known as the "soldier-beetle" in Poway Valley (twenty-five miles northeast of San Diego.) This name was given to it on account of the peculiar habit they have, when disturbed, of raising the elytra and wings perpendicularly, showing the bright red of their upper abdomen and walking as high as possible on their legs. The red head, red abdomen and yellow elytra, with the bandy-legged way of marching and falling into single file—one after the other, gave a peculiar soldier-like aspect to their actions.

Erosa apparently feeds upon various plants. The author's mother—Mrs. Anna G. Blaisdell—states that in 1907, when collecting a large series on Kent's Ranch at Poway, a large alfalfa field was inhabited by thousands of this beetle, feeding upon the alfalfa. Mr. L. Kent, owner of the ranch, stated that the tumbleweeds (a species of *Amaranthus* that grows to an immense size and is blown about by the wind in the fall of the year) are completely defoliated by them.

In those individuals of *erosa* in which the transverse piceous-black fascia of the elytra becomes more or less obsolete, the meshes remain black and do not become pale as in *inornata*.

Habitat.—California (Poway, San Diego Co., July 5th, elev. 700 ft., Soboba Springs, Riverside Co., June; E. P. Van Duzee, collector). Lower California (Tia Juana).

Bibliography.—Annals Lyceum, V, 159; Trans. Amer. Ent. Soc., June, 1870, p. 93; Trans. Amer. Ent. Soc., XVIII, Feb., 1891, p. 390.

Tegrodera inornata, n. var. (A race of *erosa* Lec.). Head red, prothorax rufo-piceous to black varied with red. Elytra very coarsely reticulate, middle transverse band entirely wanting, except a small sub-triangular marginal blotch, meshes always yellow.

Dr. Horn mentions a pale form taken by Mr. Gabb in Lower California. During fourteen years residence in Poway Valley, the author never saw a completely pale form of *erosa* Lec., although

the transverse piceous band was at times very much reduced and subobsolete, but in these individuals the elytral meshes were always black. *Inornata* is described so as to correlate the variants of *erosa* more exactly.

Length 23.0–27.0 mm.

Holotypes are in the collection of the California Academy of Sciences. Paratypes are in the author's collection.

Habitat.—Arizona. Exact locality has not been recorded on the specimens studied.

Tegrodera aloga Skinner.—(A race of *erosa* Lec.) Head red, antennæ and collar black. Thorax red or variegated with black. Elytra bright yellow, reticulate; black between the reticulations, with apices black. There is a transverse piceous fascia, constricted in the middle of each elytron. Elytral suture black. Abdomen and legs black. Length 14.0–26.0 mm.

Habitat.—Near the banks of the Gila River, near Florence, Arizona. Collected on May 4th, 1903, by Mr. C. R. Biederman.

Holotypes in the collection of the Philadelphia Academy of Natural Sciences.

Dr. Skinner states that his series of sixteen specimens shows no variations, except in size. It differs from *laticincta* Horn in being more coriaceous, the reticulations being much coarser and showing the background more conspicuously. The transverse elytral fascia in *laticincta* is wider and not constricted in the middle of each elytron. It may be distinguished at once from *erosa* Lec. by the distinct, black suture.

Bibliography.—Ent. News, vol. XIV, No. 6, June, 1903, p. 168.

Tegrodera laticincta Horn.—Head red, pronotum black or varied with red; antennæ black. Elytral reticulations more or less close, with a rather wide and exactly transverse piceous fascia at middle; meshes variable as to colour in the same individual, pale to black, general colour being yellow; piceous area at apex better indicated.

Length 19.0–22.0 mm.

Habitat.—California (Owens Valley; type region (Horn). Freeman and Bishop, Inyo Co., June, Dr. A. Fenyes collector).

Bibliography.—Trans. Amer. Ent. Soc., XVIII, Feb., 1891, p. 390.

NEW AND LITTLE-KNOWN CANADIAN OSCINIDÆ.*

BY J. M. ALDRICH, BUREAU OF ENTOMOLOGY,
U. S. DEPT. OF AGRICULTURE.

In 1915 and 1916 the writer received for study many lots of small flies swept by Mr. Norman Criddle at Aweme and Treesbank, Manitoba, on grains and grasses. In a few cases he added material from other points. These accumulations came to represent the Oscinid fauna of the region quite fully, and to contain several undescribed species in some numbers. It is the purpose of the present paper to describe a few of the most abundant species and to clear up some obscurities about several genera and species; it does not by any means exhaust the material which Mr. Criddle furnished with infinite industry, persistence and patience.

Type material in all the species will be deposited in the Canadian National Collection, and also in the United States National Museum.

Lasiosina Beck.

This genus, described by Becker in 1910 in the first part of his Monographie der Chloropiden (Archivum Zoologicum, 1, 73), has for its type *Chlorops cinctipes* Meig. (*Diplotoxa inconstans* Lw.), and originally included two other European species. Two of the three had been described in Diplotoxa by Loew, the other being new.

The genus, therefore, represents a subdivision of Diplotoxa, from which as restricted it differs in having longer thoracic and frontal bristles, and the cross veins less approximated, separated by about twice the length of the hind one.

Becker did not see any North American material. The first species to be found on this continent was a single female from Springer, N.M., in the National Museum, which Malloch described (Proc. U. S. N. M., XLVI, 140, 1913) as *Euchlorops similis*, placing it in the Milichinæ. From *Euchlorops vittata*, the type species of the genus, *similis* differs in having but one dorsocentral bristle, the former having a row of four. I have examined both types and also the European *L. albipila* Lw., the last in Professor Melander's collection. We have a common northern species which has come into my possession only since I saw the type of *similis;*

I am indebted to Mr. Chas. T. Greene for making comparisons with the latter, from which I conclude that it is a distinct species.

Lasiosina canadensis, n. sp. (Figs. 17, 18, 19).

Front more than half the head-width, flat, somewhat projecting over antennæ, pale yellow in colour, with the following pairs of bristles, large for the family: 3 and sometimes 4 fronto-orbitals; 1 divergent ocellar; 1 convergent post-vertical or post-ocellar; 1 inner vertical, strongly convergent, just outside the hind angle of triangle; 1 outer vertical, strongly divergent, on a slight swelling farther back than preceding; there are also 40 or 50 small black hairs, mostly on the anterior half of front, of which one or two pairs near the median line may be a little larger. Triangle distinct, of moderate size, its sides convex, the apex drawn out in a slender point which almost reaches the extreme anterior edge of the front; ocellar dot black, connecting with black of occiput, rest of triangle dark yellow to brown, subshining, often with darker margin. Face and bucca light yellow, the latter over half the eye-height; eye strikingly elongated lengthwise of the head; antennæ of moderate size, yellow, in the female the third joint wholly infuscated, in the male it is largely or wholly yellow, the infuscation usually confined to a spot at base of arista; the latter black, bare, Palpi yellow in male, distinctly brown in female. A pair of small, pale vibrissal hairs. Back of head yellow except centrally and directly behind the posterior curve of eye.

Fig. 17.— *Lasiosina canadensis*, head of male, side view

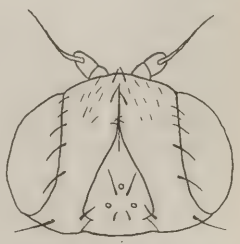

Fig. 18.—Same from above.

Thorax opaque yellow to reddish, the notum with three broad opaque black stripes, the middle one narrowed or abbreviated behind, lateral ones distinctly shortened in front, not connected with the dark of humeri; scutellum yellow, its sides blackish; postnotum dull black; pleuræ with a shining black spot on lower edge

of mesopleura and a larger on the sternopleura, the latter, however, opaque below; an opaque black spot on pteropleura and one above hind coxa. Halteres white. The bristles of the thorax are as follows: humeral 2–3; notopleural 3; postalar 1; posterior dorsocentral 1; scutellum 2 pairs, the outer small.

Abdomen rather uniform subshining brown above, the last segment more or less yellow; the hairs are pale except along the sides apically and on last segment, the male showing more dark then the female; male hypopygium black, shining.

Legs dark yellow including tarsi, but there is some tendency to a dark ring on hind tibiæ and to a vague darkening of the front tarsi and the basal half of hind femora.

Fig. 19.—Same species, wing.

Wing subhyaline, venation as in Chlorops; the distance between cross veins is from 1½ to 2 times the hind one.

Length 2–2.6 mm.

Eleven males and twenty-two females. The male is from Ogema, Sask., June 16, 1916;. Paratypes are from Ogema (6) and Estevan (2), Sask.; Treesbank and Aweme, Man., (18); Sheridan, Wyo., (1, Metz); Pullman, Wash., (1, Melander); Bovill, Ida., (1, Melander); Powell Co., Mont., (1, Mann); and Saranac Lake, N.Y., (1, Johannsen).

The type of *similis* Mall. is in general very similar, but although a female it has the antennæ and palpi coloured as in the male of *canadensis*, and "tibiæ darkened from near base, becoming black at apices; tarsi black."

The European *cinctipes*, type of the genus, has the same sexual distinctions in the colour of antennæ and palpi as in *canadensis*, or essentially the same.

Dicraeus Loew.

This genus was established in Berl. Ent. Zeitsch. in 1873 (XVII, 51) for the single species *obscurus*; Becker (Mon. Chlor. I, 111, 1910) regards this as synonymous with *raptus*, Haliday

(Ann. Nat. Hist., XXII, 187, 1838, as Oscinis). Thus the type species becomes *Dicræus raptus* Hal. Loew gives as generic characters that the costa ends before reaching the fourth vein, the hind cross vein is absent, and the second vein is straight, unusually long, and parallel with the third. He placed it in Chloropinæ on the costal character. Becker (op. cit., 109) finds five species of the genus in Europe, of which only one lacks the hind cross vein, while three have the costa fully reaching the fourth vein. Thus he makes absence of the cross vein only specific (Strobl, in Tief's Nachlass, 64, 1901, had argued that it is merely varietal); and what is more surprising, he reduces to specific value in this little group the costal character also, which elsewhere in the family is decidedly of subfamily importance, and has been so considered by Becker himself (the first dipterist to make use of the character was Fallén, Oscinides, 1820, p.3; he separates two groups of his genus Oscinis by it). In Becker's use of Dicræus, the chief generic character is the unusually long second vein; he places the genus, I think correctly, in Oscininæ close to Oscinis.

In his treatment of the nearctic Oscinids (Mon., IV, 103, 1912), Becker mentions the European *Dicræus ingratus* Loew (Zeitsch. f. Ent. Breslau, XX, 26, 1866, as Eutropha) as occurring in Idaho and Washington, but says the specimens have a little shorter second vein than the European. However, on examining my two Idaho specimens returned by him, I find that they have the costa evidently reaching the fourth vein, so they would not go to *ingratus* in Becker's own table of the European species. The same is true of all but one of about 70 specimens that I have since accumulated. The character is possibly not of specific value, though so taken by Becker. I have not seen European material, and the case is not free from doubt; but in view of the discrepancies and the geographical separation I believe myself justified in describing ours as a distinct species. The figure of the wing shows the course of the second vein, which is the main generic character; the rest is included in the description.

Dicræus incongruus, n. sp. (Fig. 20).

Shining or subshining black robust species. Frontal triangle subshining, not very distinctly bounded, ending acutely at about

the second third of the front; anterior third or more of front broadly yellow; antennæ dark yellow, third joint small, round, with darker upper edge or more; arista short, bare; face, epistoma and bucca yellow, the last with narrow shining black lower edge, the dark line continuing up nearly to the antenna, between the parafacial and central part of face; bucca from one-fourth to one-third the eye-height; palpi brown; edge of mouth black; proboscis small, blackish; eyes round, bare; back of head black. Front with four or five minute orbitals; ocellars minute, erect, convergent.

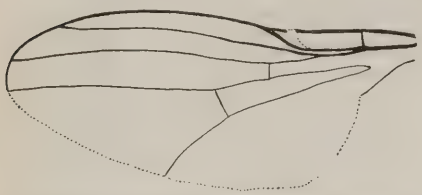

Fig. 20.—Dicraeus incongruus, wing of female.

Mesonotum shining black, yet with very thin, delicate pruinosity, the abundant minute hairs not arranged in rows, and no noticeable punctures. Chætotaxy: dc. 1, hum. 1, stpl. 3, postal. 2, sc. 2 pairs nearly equal, erect. Pleuræ shining black except upper hind part of mesopleura and the region behind and just below the wing. Halteres lemon yellow with brown stem. Scutellum concolorous with mesonotum.

Abdomen black, not very shining, with only a few hairs, which are black; the male has a polished, knob-like black genital segment, from which project forward a pair of long, stout, nearly straight black forceps, reaching almost to the hind coxæ, very characteristic.

Coxæ, trochanters, and femora black, the knees narrowly yellow; hind tibiæ black to tip, a little widened, not with "sense organ;" fore and mid tibiæ yellow to brownish, tarsi wholly yellow.

Wings distinctly milky, veins black, the fifth paler, especially its last segment; the first vein is merely a light streak in the wing, invisible except in favourable light, at its apex the costa is broken more distinctly and widely than in any other Oscinid that I know. As this wide break is shown in Becker's figure of the type species, it is probably of generic importance. Venation as figured. In order to determine the trustworthiness of the costal character, I measured with eye-piece micrometer the distance between the tips of the first and second veins, and between the second and third,

dividing the former by the latter. This I did with five specimens of each sex: the males gave 2.63; 2.70; 2.75; 2.81; and 2.20,—average 2.62;—while the females gave 2.75; 3.50; 3.50; 3.00; and 4.00,—average 3.35.

Length 1.5 to 1.7 mm.

Seventy-five specimens, both sexes: 68 from Treesbank, Man., (Criddle); 2 Moscow, Idaho, determined by Becker as *Dicræus ingratus;* 1 Potlatch, Idaho; 1 Emigration Canyon, Utah, back of Salt Lake City, about 7,000 feet; 3 Powderville, Mont., (R. R. Parker). The Potlatch specimen is dated June 20, the rest all in July.

ELACHIPTERA PLANICOLLIS, Beck.

Becker, Mon. Chlorop., IV, 114, 1912 (Oscinella).—Collins, Ida. (By mistake Collins, Texas).

The type is in Professor Melander's collection, and until I saw it in 1916 I failed to identify the species, having it in my collection as *Elachiptera n. sp.* It is in reality very closely allied to the abundant *Elachiptera longula*, having the same elongated shape, diagonal eye, flattened thorax and scutellum; but differing in having the arista not thickened and all the femora black. The colour as in *longula* is opaque, but inclines more to plumbeous. As far as the aristal character is concerned, there is a little variation in the thickening in both species, so I have specimens running together in this respect. Becker placed *longula* in Melanochæta, in which he also placed *aliena*, a species having a plain arista like that of *planicollis;* but at the same time he admitted that there was no natural line of division between Elachiptera and Melanochæta, either in the European or North American fauna.

My specimens of *planicollis* are the following: 26 from Treesbank and Aweme, Manitoba, collected by Mr. Criddle from June to September; 4 from Chatcolet, Idaho, August 15, collected by Professor Melander; and 1 from Waubamic, Ont., near Parry Sound, collected by H. A. Parish.

Oscinis criddlei, n. sp. (Fig. 21.)

A black species with the fore and middle tibiæ and all the tarsi wholly yellow, and the third antennal joint subangulated above at apex.

Eyes hairy; frontal triangle shining black, short, ending in an acute angle about the middle of the front; rest of front opaque, blackish, the lower part sometimes indistinctly paler; antennæ black, third joint reddish on inner side, rather large and of very characteristic shape, almost angulated above apically; arista bare; epistoma and bucca varying from dark yellow to brown, the latter about one-fourth the eye-height; palpi black; proboscis small, short, dark; occiput black. Thorax and scutellum above subpollinose, gray, the black ground colour very evident, shining through; the pollen of dorsum extends down over the hind part of the mesopleura, and also behind the wing to the halter, which is yellow; rest of pleura shining black; scutellum with a pair of good-sized bristles at apex, and a much smaller pair outside and higher. The mesonotum has short, stout, brown hairs, rather scattered; in strong light they look pale. Abdomen black above, generally more brownish basally, with scattered pale hairs. Coxæ, femora and middle of hind tibiæ black; trochanters, tips of femora, front and middle tibiæ, all but middle of hind tibiæ, and all tarsi to their tips, yellow; claws black. Wings hyaline, veins rather pale, venation ordinary; tip of second vein at 3/5 the distance from the first to the third.

Fig.21.—Oscinis criddlei, antenna, inner side.

Length 1½ mm.

Fifty-eight specimens, both sexes, all taken in July and August at Treesbank and Aweme, Manitoba, by Norman Criddle, in whose honour I name the species in appreciation of his active and continued assistance in my work on flies of this family.

Oscinis scabra, n. sp.

An opaque gray, short, broad species allied to *trigramma*, but not vittate. Front almost one-half the head-width, square, the short, opaque triangle blending with the rest, lower half of front yellow, slightly prominent above antennæ, the whole surface punctured except close about ocelli, the setæ very short, hardly visible; antennæ yellow, third joint orbicular, infuscated on apical half, arista short, bare; palpi yellow, proboscis small, retracted; bucca yellow, one-third the eye-height; back of head opaque gray.

Thorax short and broad, square, flat, densely gray pollinose on black ground, with distinct, close punctures which are not arranged in rows and bear only minute hairs, giving the mesonotum a bare appearance; the lateral setæ very short but stout; scutellum a little elongated, flat, punctured and concolorous with dorsum, with only one pair of apical setæ of noticeable size; pleuræ black, gray-pollinose except in the depressions above the front and hind coxæ; postnotum shining black; halteres yellow.

Abdomen subshining black above, indistinctly paler basally, opaque black below.

Legs including coxæ opaque black, the knees vaguely, the tibiæ except a broad, median ring on middle and hind ones, and all the tarsi yellow.

Wings subhyaline, veins blackish, the costal segment before the tip of second vein less than double the one beyond it.

Length 1.3 to 1.5 mm.

Thirteen specimens, both sexes: ten from Treesbank, Manitoba, May 6, 1916, including the type, a female; two Aweme, Manitoba, Sept. 12 and Oct. 13, 1916; one Estevan, Saskatchewan, May 20, 1916. All collected by Norman Criddle.

NEW HALICTINE BEES FROM CHILE.

BY T. D. A. COCKERELL, BOULDER, COLORADO.

The Chilean bee-fauna is one of the most remarkable in the world, many of the species having a facies quite distinct from those of other parts of South America. Many species were long ago described by Spinola; others have been made known at intervals since, but there can be no doubt that very many remain to be discovered.

Agapostemon (Pseudagapostemon) xanthorhinus, sp. n.

♂.—Length about 7.5 mm.; anterior wing 5.5; bluish-green; clypeus (except two dots and narrow lateral margins), labrum and mandibles (except black basal spot and ferruginous apex) yellow; a yellow stripe across tubercles; legs bright yellow, with the coxæ, trochanters, anterior femora basally, middle and hind femora

largely behind (but not apically), piceous; clypeus produced, but ordinary; sides of face with dense, appressed, very pale yellowish hair; front dull and granular; antennæ long, the scape and two following joints yellow, the others pale ferruginous, the flagellum more or less dusky above, especially at base; fourth antennal joint about as long as second and third together; mesothorax and scutellum densely punctured but shining, with thin, rather long, pale hair; basal area of metathorax covered with coarse, vermiform rugæ; tegulæ pale, with a yellow spot; wings hyaline, stigma pale ferruginous, nervures testaceous; first recurrent nervure joining second submarginal cell beyond the middle; hind legs not modified; abdomen closely punctured but shining, with thin hair, but no bands; apical segment pale reddish, emarginate; venter mainly yellow, hind margin of fourth segment broadly W-like, the margins of the notch ferruginous.

Chile (E. C. Reed), U. S. Nat. Museum. Closely related to *A. citricarnis* (*Halictus citricarnis* Vachal), but that species differs by the somewhat greater size, the presence of yellow depressed hair on abdomen, the granular area of metathorax, the yellow antennæ, and the slightly emarginate fourth ventral segment. Also related to *A. paulista* (*Pseudagapostemon paulista* Schrott.), but differs in being smaller, with yellow mandibles. It has the clypeus yellow with two dots, as in *A. paulista*, not as in *A. nasua* (*Pseudagapostemon nasua* Schrott.). It does not seem advisable to regard *Pseudagapostemon* as more than a subgenus.

Rhopalictus corinogaster chilöeensis, subsp. n.

♀.—Wings dusky, nervures pale fuscous; tegulæ black, anteriorly margined with testaceous; legs and antennæ darker; abdomen darker red, first segment black except the broad, apical margin.

Island of Chilöe, Dec., 1894. Collector unknown. Type in my collection.

Rhopalictus callicladurus, sp. n.

♂.—Length about or nearly 9 mm.; head and thorax metallic green, with abundant white pubescence; labrum, mandibles and apex of clypeus pale testaceous; eyes deeply emarginate and

strongly converging below; antennæ very long, the rather swollen scape black; the flagellum ferruginous, dusky above, strongly crenulate; front, sides of thorax and metathorax blue-green, but face, mesothorax and scutellum yellowish green; mesothorax finely punctured but moderately shining; area of metathorax with radiating plicæ, more or less connected by cross-ridges; tegulæ pale testaceous; wings ample, hyaline, stigma and nervures sepia; first recurrent nervure joining second submarginal cell very near end; tibiæ and tarsi, and much of apical part of femora, bright ferruginous, but femora otherwise green; abdomen clavate, long and slender, first segment swollen dorsally; first segment practically black above, second and third very bright ferruginous, fourth and fifth deep metallic green with hind margin red, apex red.

Chile (*E. C. Reed*), U. S. Nat. Museum. Easily known by the peculiarly coloured abdomen, but nearest to *R. corinogaster* (Spinola).

Rhopalictus melanocladus, sp. n.

♂.—Length about 8.5 mm.; head and thorax black, with white hair, the entirely dull and granular front, vertex, mesothorax and scutellum with a faint greenish tint; clypeus and labrum black, mandibles dark reddish beyond middle; eyes deeply marginate and strongly converging below; antennæ extremely long, black, the flagellum dark coffee-colour below, and strongly crenulate; area of metathorax strongly reticulate; tegulæ dark rufo-fuscous; wings brownish-hyaline, stigma and nervures dusky-ferruginous; second submarginal cell not very broad, receiving first recurrent nervure a short distance from its end; legs black, with the long tarsi; pale ferruginous; abdomen elongate, clavate, first segment swollen dorsally, but its apical part in a straight line with second (which is not true of *R. callicladurus*); abdomen black, with a very faint greenish tint, hind margins of segments obscurely reddish; apex pale ferruginous.

Chile (*E. C. Reed*), U. S. National Museum. Related to *R. chilensis* (Spin.), the type of the genus, but readily distinguished by the dark abdomen and the shape of the second submarginal cell.

AFRICAN BUPRESTIDÆ (COL.) OF THE GENUS STERNOCERA.

BY RICHARD T. GARNETT, BERKELEY, CAL.

The following table will separate the various forms of *Sternocera interrupta* Olivier:

I. Impressions of elytra present.
  A. Foveæ of thorax and elytra with white pilosity.
    B. Beneath dull bronze, above black; elytra black or dull castaneous, lighter punctured.....*S. interrupta* Olivier.
    BB. Entirely dull bronze; elytra rugose.....var. *reticulata* Kerremans.
  AA. Foveæ of thorax and elytra golden.
    B. Entirely bronze; base of abdominal segments metallic purple.....var. *klugi* J. Thomson.
    BB. Below golden green; elytra castaneous.....var. *mephisto* J. Thomson.
  AAA. Fovea of elytra red.....var. *vandykei*, subsp. nov.
II. Impressions of elytra absent.....var. *immaculata* Kerremans.

S. interrupta Olivier. Thorax entirely covered with irregular pits, smaller towards the middle and filled with white pubescence; beneath sombre bronze, above black, elytra black or sombre castaneous, more smoothly punctured. Elytra with 2 vittae at base on each side filled with white pilosity, the inner one small and short, the outer one long and broader and another on the elytral fold beneath the humeral umbone; posterior half of elytra with long vitta on each side filled with whitish pilosity, this vitta often broken up. Beneath rugose, entirely covered with the same white pubescence, except the median line where the pubescence is scanty or lacking altogether. Length: 27–42 mm. Width: 10–15 mm. Habitat: Damaraland; Senegal; Zambesi; Dakar.

Var. **reticulata** Kerremans. Entirely sombre bronze, metallic, with the elytra very strongly reticulate. Length: 26–35 mm. Width: 10–13.5 mm. Habitat: Senegal; Guinee.

Var. **klugi** Thompson. Fovea of thorax and elytra golden; entirely bronze; base of abdominal segments metallic purple. Length: 34 mm. Width: 13 mm. Habitat: White Nile; Senegal.

Var. **mephisto** Thomson. Fovea of thorax and elytra golden; Beneath golden green, shining; elytra castaneous.

Habitat: White Nile; Senegal; Benue; Niger.

Var. **vandykei** subsp. nov. The form, size, and punctuation are as in *S. interrupta* Olivier but the colouring is radically different from that of other varieties. Head and thorax the same as *interrupta*. Differs by having all the elytral impressions filled with red pilosity including the one below the humeral umbone; also by having a row of semi-triangular red spots on each side of the abdominal segments, those on the fourth and fifth segments largest, that on fifth running from top to bottom and from margin inwards from each side for 1/3 the width of the segment; segment 4 also has 2 extremely small more rounded spots in centre, not spaced evenly; the pilosity being otherwise normal and white. This variety is remarkable in that both red and white pilosity is present and the hairs of each colour are equally dense on the ventral surface of the abdomen. Length: 36 mm. Width: 14½ mm. Habitat: Bafulabe (Senegal). One specimen. Type in my collection.

Taken by W. F. Blakeslee. The specimen was sent to me loose and as a result it has lost 2 3/5 tarsi and 1 joint of an antenna. I take great pleasure in naming this after my friend and former teacher, Dr. Edwin C. Van Dyke of Berkeley, California.

Var. **immaculata** Kerremans. Impressions of elytra absent.

Stevensii and its one good variety may be separated as follows:

A. Thorax black; elytra castaneous.....*S. stevensii* Waterhouse.

AA. Thorax brassy; elytra very dark brown, with blue reflections.....var. *waterhousei*, subsp. nov.

S. stevensii Waterhouse. For description of this and its variety I will quote Mr. Waterhouse in toto. "Resembles and is closely allied with *S. interrupta*, but it differs in the sculpture and ornamentation of the abdomen. Head and thorax black, with numerous moderately strong punctures and a median impressed line, all filled with whitish pubescence, as in *interrupta*. Each elytron with a small dirty white spot near the scutellum, an elongate spot in the middle of the base, a longer one below the shoulder, and a line behind the middle (near the side). Body beneath dark aeneous. Abdomen marked with punctures, each puncture bearing an obscurely brassy hair. These punctures are placed in

groups of 2 or 3 or in undulating lines at the sides of the segments. On the 3rd and 4th segments these punctures are crowded together so as to form an undulating band, leaving a smooth shining spot on each side at the base, and a wide, triangular, sparingly punctured area in the middle. Punctures in the apical segment crowded together so as to form triangular patches on each side, leaving the middle space sparingly punctured." Length: 35 mm. Width: 13 mm. Habitat: West Africa; N. Nigeria.

Var. **waterhousei** subsp. nov. "Thorax brassy. Elytra very dark brown, with blue reflections." Habitat: Damaraland. Mr. C. O. Waterhouse in Ann. Mag. Nat. Hist. No. 82, p. 248 gave this variety without a name, and I have taken the liberty of affixing one to it, the characters given seeming sufficient to warrant it.

A GROUP OF AMERICAN HALICTINE BEES SIMULATING THE OLD-WORLD GENUS NOMIOIDES.

BY T. D. A. COCKERELL, BOULDER, COLORADO.

The gaily-marked little Halictine bees of the genus *Nomioides* are widely distributed over the Old World, even extending to Australia (*N. perditellus* Ckll.). They are extraordinarily like our American species of *Perdita*, but structurally are so distinct that we can hardly suppose that there is any particular affinity. More recently, however, there has been found in South America a group of *Nomioides*-like insects which might almost be referred to the Old World genus, did they not possess a sharply pointed marginal cell as in *Halictus*. This affords another instance of similarity between neotropical and Old World insects, which may be due to common descent or to "convergent evolution," or to both. The group referred to, with ten described species, has been found in the Andean region, but it now appears that it extends northward to Panama. The following new species has been collected by Mr. Busck.

Halictus xanthinus, n. sp.

♀.—Length 5 mm. or a little over; head and thorax brilliant emerald green; mandibles pale yellow; clypeus ferruginous in middle and dusky reddish apically, but above and at sides green;

sides of face shining; inner orbits concave but not abruptly emarginate; scape long, black; flagellum dark above and ferruginous beneath; mesothorax dull and granular, with fine, very short, pale pruinose pubescence; tubercles yellow; tegulæ light fulvous; wings hyaline, nervures fuscous, outer nervures not weakened; first recurrent nervure joining extreme apex of second submarginal cell; area of metathorax large, microscopically reticulate, not plicate; legs pale yellowish or fulvous, the middle and hind tibiæ and tarsi fuscous, the middle tibiæ pale in front; hind spur with three very long spines; abdomen broad, smooth and shining, reddish fuscous and fulvous marked with lemon yellow; first segment broadly yellow basally and at sides except apically, where it is dark brown, but otherwise the segment is pale fulvous; second and third segments with a broad, yellow basal band, widest sublaterally, the segments otherwise fulvous in middle and dark brown laterally; fourth and fifth segments reddish-fuscous, with basal yellow bands; venter pale yellow, with the last three segments fuscous.

Porto Bello, Panama, March 13, 1911. (*Aug. Busck*), U. S. Nat. Museum. Nearest to the Brazilian *H. callichroma* (Ckll.), but with entire yellow bands on abdomen. The structure of the metathoracic enclosure is quite the same, with fine reticulations, the lines mostly transverse. Of the other species of the group, I possess *H. ephelix* Vach., from Marcapata, Peru; *H. phacodes* Vach., from Mapiri, Bolivia; and a cotype of *H. maculiventris* (Crawford), described under *Augochlora*. Crawford's species seems doubtfully distinct from *H. trinax* Vach., but I have no authentic material of the latter. Crawford and I, describing species of this group, have referred them to *Augochlora*. Vachal referred all the species to *Halictus*, but he included *Augochlora* in *Halictus*. Schrottky in 1910 placed the species in his genus *Nescorynura*. They are certainly not genuine *Augochlora*, nor do they agree well with typical *Nescorynura* or *Halictus*. They may be considered a distinct subgenus of *Halictus*, or even a separate genus. I do not propose a name, because it is possible that *Ctenocarynura* Schrottky (Deutsch. Ent. Zeit., 1914) is applicable. I have not been able to procure Schrottky's description, and there is no reference to the genus in the Zoological Record.

RECENT CANADIAN PUBLICATIONS.

Under this heading we propose to present notices from time to time of entomological publications by writers residing in Canada, or such as appear in Canadian periodicals, whether by Canadians or not. Exceptions will be made in the case of papers published in the Annual Reports of the Entomological Society of Ontario and the present journal. Short articles or those of a popular character will, as a rule, be merely listed.

Authors will greatly assist the Editor by sending him copies of their publications for notice in this section.

The following papers were all published during the present year:

PROCEEDINGS OF THE ENTOMOLOGICAL SOCIETY OF NOVA SCOTIA FOR 1917. No. 3. Truro, January, 1918. Pp. 1–96.

This excellent report gives ample evidence of the vigorous condition of the youngest branch of our Society, and is a most creditable production. It contains no less than sixteen papers by ten contributors, dealing with a variety of subjects, both economic and faunistic, and these are illustrated by 15 plates, most of them half-tones of fine quality.

The following papers are mainly of economic interest:

Work of the Dominion Entomological Laboratory in Nova Scotia. By G. E. Sanders. An outline of the results of experiments testing the effects of different combinations of insecticides and fungicides in apple spraying.

Notes on the Yellow Leaf Hopper of the Birch (Oncopsis sobrius Walk.). By W. H. Brittain. The life-history is given in detail and is illustrated by two plates, showing all the stages, and the hymenopterous parasite, *Polynema striaticorne* Gir.

Miscellaneous Notes on the Apple Maggot. By. W. H. Brittain.

The Zebra Caterpillar. By H. G. Payne.

The Fall Cankerworm. By H. G. Payne.

The Rusty Tussock Moth. By H. G. Payne.

The White-marked Tussock Moth. By H. G. Payne.

Detailed life-histories of these four species are given, based on original data. They are illustrated by 5 excellent photographic plates.

Empoasca unicolor as an Apple Pest. By W. H. Brittain and L. G. Saunders. Discusses the injuries caused by this insect, its life-history and methods of control. One plate.

Introduction of the Parasites of the Brown Tail and Gipsy Moths into Canada. By L. S. McLaine. A concise account of the methods employed in collecting and rearing the three important natural enemies of the Brown Tail and Gipsy Moths, viz., *Apanteles lacteicolor*, *Compsilura concinnata* and *Calosoma sycophanta*, and their introduction and liberation into the infested parts of New Brunswick and Nova Scotia

The Dropping of Apples Caused by Spraying with Lime-Sulphur. By G. E. Sanders and A. Kelsall. A valuable paper, discussing the available data on this problem, including original investigations on the factors which influence lime-sulphur injury in Nova Scotia.

Notes on the Biology of Lygus pratensis in Nova Scotia. By W. H. Brittain and L. G. Saunders. Discusses the life-history of this injurious insect, its food habits at different periods of the life cycle, oviposition, injuries, etc.

The papers dealing with general and faunistic subjects are as follows:

The Tree Hoppers of Nova Scotia. By W. H. Brittain. This paper and the following one are part of a useful series of articles on the insects of Nova Scotia, designed to make their identification easier for the general student. Keys to the genera and species are given and descriptive notes on the latter. The life-history of *Publilia concava*, not previously known, is given in detail. Twelve species are listed and are illustrated in 5 plates.

The Locustidæ of Nova Scotia. By C. B. Gooderham. Contains keys to the subfamilies, genera and species. Six species are recorded, all of which are described and five of them illustrated in detail.

Some Reasons for Studying Pupæ. By Edna Mosher. A suggestive paper, showing the need of more careful study of pupæ from various points of view, economic, taxonomic and morphological.

Some Notes on the Crambinæ of Nova Scotia. By E. Chesley Allen. An annotated list of 21 species of these moths.

Spiders Collected in Nova Scotia and New Brunswick by Robt. Matheson in 1912. By J. H. Emerton. Seventy-two species are listed.

Publications of the Entomological Branch, Dominion Department of Agriculture.

In the effort towards increasing food production the Entomological Branch is doing valuable national service. In connection with this work a series of circulars or "Crop Protection Leaflets" were issued and distributed during the early part of the year to be of timely value to growers during the present season. These leaflets dealt with the most approved methods of controlling the more serious insect pests, and are all appropriately illustrated.

Those published during 1918 are as follows:

No. 3. *Cutworms and Their Control.* By Arthur Gibson.
" 4. *Root Maggots and Their Control.* By Arthur Gibson.
" 5. *Prevent White Grub Injury.* By Arthur Gibson.
" 6. *How to Control Locusts or Grasshoppers.* By Arthur Gibson.
No. 7. *Rats and Mice.* By C. Gordon Hewitt.
" 8. *Aphids or Plant Lice.* By Wm. A. Ross.
" 9. *The Pea Weevil.* By Arthur Gibson.
" 10. *Arsenate of Lime.* By George E. Sanders.

The following articles by members of the staff of the Entomological Branch have appeared in the pages of the Agricultural Gazette, vol. 5, 1918.

The Black Cherry Aphis. By Wm. A. Ross (No. 1, pp. 13–16). Describes the history, habits and depredations, and the life-history of this pest. Illustrated from four photographs.

Some Results of Scientific Research on Insect Pests in Canada. By C. Gordon Hewitt, D. Sc. (No. 2, pp. 128–132). A brief exposition of the value of entomological research to agriculture and forestry as illustrated by some of the more striking results of the work of the Dominion Department of Agriculture.

The Alfalfa Looper, Autographa californica Speyer. By Arthur Gibson. (No. 2, pp. 132–136). This insect, which is widely distributed in Western North America, has been known as a pest in Canada only since 1914, when an outbreak occurred in British

Columbia. The habits, life-history, crops attacked, natural enemies and methods of control are described.

The Predacious Mite, Hemisarcoptes Malus Shiner and its Relation to the Natural Control of the Oyster-shell Scale. By John D. Tothill. (No. 3, pp. 234-239, 3 figs.). This mite, which feeds on the eggs and sometimes the later stages of the oyster-shell scale is believed to be the most important single factor in the natural control of the scale in Eastern Canada. It has not been found in British Columbia.

Some Ladybird Beetles Destructive to Plant Lice. By Wm. A. Ross. (No. 4, pp. 344–347, 2 figs.). This paper contains brief descriptions and notes on the habits of the eight species of ladybird beetles which are most important in the natural control of aphids on the Niagara Peninsula. Experiments were made to determine the egg-producing capacity of each species, the duration of the various stages and the feeding capacity of the adults as measured by the number of aphids consumed in a given time.

The Habits and Control of White Grubs in Manitoba. By Norman Criddle. (No. 5, pp. 449–454). Mr. Criddle has made a careful study of the four species of *Lachnosterna* found in Manitoba (*L. anxia, nitida, drakei* and *rugosa*). He describes the general life-history of these beetles and the peculiarities of the habits and habitat of each species. He recommends ploughing between May 14 and July 1 at an average depth of 5 inches, this being a time when none of the stages are below plough line and when the largest number of all stages will be turned up, the majorlty being then usually picked up by birds.

He also discusses thoroughly the natural control of these insects and the crops most suitable for sowing on infested lands.

Some Blood-sucking Flies of Saskatchewan. By A. E. Cameron. (No. 6, pp. 556–561, 6 figs). An interesting general account of the more troublesome mosquitoes, black flies and horse flies of the Saskatoon district.

The Control of Insects in Ships by Steam. By R. C. Treherne. (No. 7, pp. 668–669). Describes an instance where a vessel infested with the rice weevil (*Calandra orysæ*) was freed from infestation by subjecting the hold to a high pressure of steam, after failure by an all-night fumigation with sulphur.

Some Notes on the Natural Control of the Cherry-tree Ugly Nest Tortricid, Archips cerasivorana Fitch. By A. B. Baird. (No. 8, pp. 766–771).

The action of the various parasites and other controlling factors is considered for each of the principal periods in the life-history, and their effectiveness is calculated on a percentage basis.

Other publications by the staff of the Entomological Branch are the following:

The White-marked Tussock Moth and its Control on Shade Trees and Orchard Trees. By J. M. Swaine and G. E. Sanders. Circular No. 11, March 7, 1918, 12 pp., 2 plates. This paper is divided into two parts. The first, entitled "The White-Marked Tussock Moth (*Hemerocampa leucostigma* S. & A.)" (pp. 1–11), by Mr. Swaine, gives descriptions of the various stages, the life-history, habits, kinds of trees attacked and the natural and artificial means of control. The second part, "The White-marked Tussock Moth as an Orchard Pest," (pp. 11, 12), by Mr. Sanders, describes the injuries done to fruit, and the spraying methods recommended for its control in orchards.

The Pear Thrips (Tæniothrips inconsequens Uzel) and its Control in British Columbia. By A. E. Cameron and R. C. Treherne Bull. No. 15, Entomological Branch, Dept. of Agriculture. May 8, 1918, 51 pp., 22 figs.

In this bulletin are set forth the results of a most careful and detailed investigation, extending over two years, of an insect, which has for many years been causing very serious injury to orchards on Vancouver Island, though known only since 1915 as the cause of this damage.

The chief injury consists in a "blighting" of the blossom buds in early spring, due to the entrance of the hibernated adults which feed upon the young delicate tissues within, and also to the later attacks of the larvæ, which hatch from eggs deposited in the petioles and midribs of the leaves, and the calyces and stems of the young fruit. The larvæ attack not only the blossoms and leaves but also the young fruit, causing a "russetting" of the skin known as "thrips scab." When mature the larvæ fall to the ground and, penetrating the soil, pass through the remaining stages, the

prepupal and pupal periods under ground, changing to adults late in the autumn and emerging early the following spring.

Although most destructive to pears, plums and prunes, the pear thrips readily attacks other fruit trees such as apples and cherries, besides many other trees and shrubs, the broad-leaved maple being one of the worst sufferers of all. It is not a native insect and is as yet unknown in Canada outside of Vancouver Island, though it has been reported from several localities in both Eastern and Western United States as well as from Europe.

The question of controlling this pest is thoroughly considered, and the authors state confidently that it can be readily held in check. Spraying is the only satisfactory method and may be applied twice or three times, according to the severity of the infestation, two sprayings in either case being made before blossoming, as treatment against the adults is more important than that directed against the larvæ. Miscible oil No. 2 in combination with nicotine sulphate gave best results for the first spray, while whale oil soap also with nicotine sulphate is most suitable and economical for the second and third sprays.

The bulletin is admirably illustrated with photographs and drawings by Dr. Cameron.

Life-history of the Leaf-eating Crane-fly, Cylindrotoma splendens Doane. By Alfred E. Cameron, M.A., D. Sc., F.E.S., Ann. Ent. Soc. Am., XI, No. 1, 1918, pp. 67–87, 18 figs.

This is an important contribution to the biology of craneflies, as the species described is a member of a particularly interesting and isolated tribe of Tipulidæ, the Cylindrotomini, the known larvæ of which live exposed upon the leaves of various terrestrial and aquatic plants, instead of living in the mud of streams or in rotten wood as is the case with most of the family.

The discovery by Dr. Cameron of the larvæ of this species feeding on the leaves of the false bugbane (*Trautvetteria grandis*) on Vancouver Island is the first finding of the immature stages of *Cylindrotoma* in America, the only other nearctic species of the tribe, whose larva is known, being *Liogma nodicornis*. The other four species with known larvæ are all palæarctic and belong to as many genera, one of which is also a *Cylindrotoma*.

The writer succeeded in obtaining eggs from reared parents which mated in the rearing cages, and from these larvæ were obtained and successfully brought to maturity. More than 100 adults in all were reared.

In addition to careful observations on the behaviour in copulation, mechanism of oviposition, duration of immature stages, larval habits, etc., detailed descriptions are given of the larva and pupa, containing valuable information on the minute structures of the larval mouth capsule and other structural features. The figures illustrating these features are the work of the author and are admirable.

(To be continued.)

ENTOMOLOGICAL SOCIETY OF ONTARIO.

The 55th Annual Meeting of the Society will be held at the Ontario Agricultural College, Guelph, Ontario, on Wednesday and Thursday, November 6th and 7th, 1918.

Members intending to present papers are requested to send in to the Secretary the titles (stating length of time required for reading and whether a lantern is desired) as soon as possible, in order that the programmes may be issued a week or more before the meeting. It is requested that papers do not exceed a twenty-minute time limit.

Accommodation for visitors can be secured in the men's residence at the College. Those intending to be present should send in their names to the Secretary on or before November 1st.

The Plant Pathologists of Canada have arranged to hold their Convention at the same place on Friday and Saturday, November 8th and 9th, immediately following the Entomological Society meeting.

L. CAESAR, PRESIDENT,
O. A. College,
Guelph, Ont.

A. W. BAKER, SECRETARY,
O. A. College,
Guelph, Ont.

October, 1918

Mailed October 10th, 1918

The Canadian Entomologist.

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POPULAR AND PRACTICAL ENTOMOLOGY.

Insect Tropisms.*

BY PROFESSOR A. WILLEY, McGILL UNIVERSITY, MONTREAL.

The behaviour of insects, like that of other animals, is the result of the interaction between the organism and the medium or environment in which it lives. When properly understood it has the value but not always the precision of a chemical reaction, being the summation of a long series of physico-chemical changes.

The fundamental relation between organism and medium is determined by the necessity of the former to extract its nutriment from the latter. The medium not only furnishes food for the organism but also for its enemies and, in addition, it is the source of catastrophic danger. In order to procure its food the insect has to circumvent the enemies which persecute it and evade the dangers which threaten it. There are thousands of ways of avoiding or minimizing risk and thousands of species to adopt one or other of these ways. They all come under the head of "avoiding reactions," whether they operate as visible movements or attitudes, or as structural features; in the former case they may be called "global" reactions, in the latter they are cell or tissue reactions, *i. e.*, reactions of the idioplasm resulting in adaptive growth.

After the emergence from the egg the life-history of the holometabolous insects is broken up into two sharply marked periods of active struggle for existence. The larval activities are directed towards solving the problem of food and growth; those of the imago are concerned directly or indirectly with the problem of reproduction to which all the sense-organs are subordinated. A larva has only one question to answer: What can be eaten with impunity? For the imago the burning question of the day is: Where can the eggs be laid with safety? It is one of the tasks of the entomologist to ascertain how these elementary realities are

*Abstract of paper read at 54th Annual Meeting of the Entomological Society of Ontario, Nov. 9th, 1917.

faced, and that is the reason for studying insect behaviour. It is not enough for the imago to deposit its eggs upon the food-plant of its larva. The crisis of pupation has still to be passed. And all this is done, without reflection or premeditation, by hereditary predestination depending ultimately upon the specific physico-chemical properties which make up the "hereditary patrimony" of the organism.

The habits of the insects of to-day afford a picture, more or less altered by repetition and by circumstances, of the habits of their ancestors, so that their observation has an antiquarian or historical interest as well as an economic bearing, and it is not necessary to mix up these two aspects. It is one of the paradoxes of natural history that ancestral types can persist for untold ages alongside the more differentiated types. The tropical genus *Peripatus* is to the insect world what *Amphioxus* is to fishes. The latter has the English name of lancelet, and by a corresponding verbal transposition, *Peripatus* might perhaps become known as the "larvelet" since it has some of the properties and much of the appearance of an insect larva. Its habits are to this extent amphibious that whilst breathing air it requires an excess of moisture; hence, like the alpine salamander amongst batrachians, it is characteristically, though not invariably, viviparous. Whether oviparous or viviparous, there is no free larval period in the life-history of *Peripatus;* its trophic and reproductive phases are not separated.

The multudinous traits of insects may be grouped under two categories corresponding approximately with their larval and imaginal phases. Idiotropic tendencies comprise the feeding, resting and protective devices of individual life. Phylotropic tendencies comprise habits looking to the preservation of the race, *e. g.*, nest-building, egg-laying and brood-nursing. As an example of a casual observation of an idiotropic performance I may relate a small incident in my own experience. In December, 1905, I was descending the bund or high embankment of one of the ancient irrigation tanks of Ceylon when I noticed a dark brown Mantid ensconced amidst the green foliage of a low shrub. It happened to be a male of *Gongylus gongylodes*, a floreate species with foliaceous expansions on prothorax, legs and abdomen, known to Aldrovandus and figured by him in 1602.

As I approached it, several times in succession, on each occasion the insect squared the elbows of its fore limbs nearly at right angles to the body, the femur bent close against the long coxa, and the tibia pressed against the femur. This alert, defensive attitude had a terrifying aspect which was enhanced by a loud, rasping sound produced by rubbing the borders of the hind femora against the rim of the fore wings. The outer free border of each fore wing is thickened by a chitinous rim which is finely serrate. In the region of the hind femur the border of the wing is slightly emarginate, allowing free play to the thigh under ordinary circumstances. The femur itself is smooth, carrying a few minute hairs, but without any rough edge.

When the insect is alarmed, each hind femur is rubbed deliberately to and fro against the saw-like edge presented to it along the concave border of the wing, and a very effective stridulating sound results from the friction. The same sound can be closely reproduced upon the dead insect by gently passing a porcupine quill backwards and forwards along the wing-border. The serrate border of the wing is also present in the female *Gongylus*, where the emargination is still more pronounced.**

Quite recently I have become acquainted with a paper by J. Wood-Mason: *On the presence of a stridulating apparatus in certain Mantidæ*, (Trans. Ent. Soc. London, 1878, pp. 263-7) in which he, described the toothed edges of the tegmina of *Gongylus*, and supposed erroneously that the sound, which he had never heard, would be produced by the rubbing of the abdomen against the toothed edge. Professor Westwood asked Wood-Mason how it was that nobody had ever heard the Mantidæ stridulate, these insects being common enough where good observers have been. The answer was "that the species in which the stridulating apparatus is present are few in number;" and it may be added that they only perform under the right kind of stimulation applied at the right moment.

The homing instinct which we admire so much in bees and ants and wasps has been shown to depend to a surprising extent upon the chemical or olfactory sensitiveness of these insects, many

****Spolia Zeylanica*, vol. III, p. 226, Colombo, 1906.

of whose actions are reducible to chemotropic responses.*** The most trival movements may have the deepest significance for the individual, and, when repeated regularly under certain conditions, they have the value of tropistic reactions. It is well not to forget that the record of a vital act is less easy to couch in critical terms than is the description of an inert form. There are several factors which influence behaviour, such as the nature of the species, the susceptibility of the individual, the place and time of observation. If for any reason, known or unknown, the behaviour is indeterminate, we can do nothing with it and the result of observation is negative. Indeed the interaction of tropisms may so confuse the issue as to render observation nugatory. It is only under the fortunate train of circumstances which permits straight and clear-cut reactions, several times repeated, that the study of behaviour becomes available for synthetic treatment.

NOTES ON NOVA SCOTIAN EUPTERYID LEAF-HOPPERS INCLUDING DESCRIPTIONS OF TWO NEW SPECIES.

BY W. L. MCATEE, WASHINGTON, D. C.

Professor W. H. Brittain, Provincial Entomologist of Nova Scotia, sent the writer a small collection of leaf-hoppers of this group, which is herewith reported upon, chiefly for the reason that characterization of two new species is required.

List of Species.

Dikraneura mali Provancher.—Truro, August 26; Digby County.

Empoasca atrolabes Gillette.—Kentville, July 3; Annapolis, July 15.

Empoasca obtusa Walsh.—Kentville, August 14, 16; Annapolis Co., August 8, 11, 28.

Empoasca unicolor Gillette.—Annapolis Co., August 11.

Typhlocyba cymba, new species.—Head and thorax pale yellow flecked with pellucid greenish yellow; elsewhere pale yellowish

***N. E. McIndoo: *Recognition Among Insects.* Smithsonian Misc. Coll., vol. 68, No. 2, Washington, 1917.

hyaline. Scutellum and a straight-sided band just behind middle of, and confined to, clavi, fuscous. Margin of last ventral segment of female concave on each side before apex. Length 4.5 mm. One specimen, a female, Halifax, N. S., Sept. 1, 1917, in collection of Nova Scotia Department of Agriculture.

Typhlocyba lethierryi Edwards.—Truro, August 17.

Typhlocyba rosæ Linnæus.—Annapolis Co., August 5; Truro, August 26; Halifax, August 5, on elm; September 1, on maple.

Typhlocyba ulmi Linnæus.—Halifax, October 6.

Erythroneura ador, new species.—Venation nearly as in *E. obliqua* Say. Coloration unusual for an *Erythroneura* being pale yellow, except fore wings which vary to golden yellow, pale apically, and tips of tarsi which are dark. Length 4–4.5 mm. Described from four females (one the type) from Halifax, Nova Scotia, August 5, 1917, on elm, and one from same place September 1, 1917. Type and three paratypes in collection of Nova Scotia Department of Agriculture and one paratype in collection of writer.

TWO NEW DIPLOPODS FROM LOUISIANA.

BY RALPH V. CHAMBERLIN, CAMBRIDGE, MASS.

The two new species described below were found represented in a miscellaneous lot of myriapods sent to me for identification by Percy Viosca, Jr., of the Southern Biological Supply Co., of New Orleans. Other diplopods in the lot are *Callipus lactarius* (Say) and *Polydermus serratus* (Say) also from Covington, *Parajulus* sp. and *Spirobolus marginatus* (Say) from New Orleans, and *Julus cærulocinctus* Wood from Rochester, N.Y. The chilopods consist of the following species: *Otocryptops sexspinosus* (Say), *Theatops posticus* (Say), and *Hemiscolopendra punctiventris* (Newport) from Covington, *Arenophilus bipuncticeps* (Wood) from New Orleans, *Neolithobius mordax* (Koch) from Lake Charles, and *Scolopendra viridis* Say from Florida.

Ethojulus amphelictus, gen. et sp. nov.

This form is separated generically from *Parajulus* because of its different type of structure in the male gonopods. The

anterior gonopods, which are ectal in position, are deeply bifid; the anterior branch is of ordinary texture, clavate in outline and pilose; the posterior branch is strongly chitinized and smooth, rather slender and blade-like, curving first caudad and then ventrad and mesad, each presenting an acute spur from its mesal edge just distad of the middle of its length. The posterior gonopods are long, slender, chitinous blades curving forward, downward, caudad and then again dorsad, thus forming three-fourths of a circle, with the tip bent slightly to one side; from near the base arises a shorter, distally acute, blade which is weakly sigmoidally bent and which extends ventrad nearly to the lower segment of the principal branch.

Sides and venter light brown. Dorsum of pale ferruginous cast, dusky; a longitudinal mid-dorsal black line; a row of large black spots along each side over the pores; above each black spot a fulvous spot and between this and the mid-dorsal line a narrow, fulvous stripe and a stripe of similar colour also commonly showing across the anterior border of the somite. The sides above, especially in anterior region of body, with a network of black lines over the lighter background. The collum covered with a similar network, a solid dark, transverse band just caudad of the anterior border, this widening toward the middle; a similar but narrower band across the caudal border, this connected with the anterior one along the median line. Vertex of head also with a network of dark lines; a solid black band between edges, this including the usual light spots below. Antennæ blackish. Legs fulvous.

In the female the second tergite extends very much below the level of the collum; angularly pointed below. The collum with a longitudinal stria just above the margining sulcus on each side. In the male the collum is more elongate, as usual in Parajulus, with the lower margin long and straight. The second tergite does not extend below the level of the collum and its lower edge is straight.

The cardo of the mandibles in the male is strongly produced below; the process narrowed angularly ventrad, its apex narrowly rounded and reaching to the level of the lower edge of the labrum.

Segmental sutures strongly curved at level of pores.

Anal scutum exceeding the valves moderately, the tip straight and acute.

Number of segments, fifty-six and fifty-eight.

Diameter of female 3 mm.; of male 2.5 mm.

Locality.—Louisiana; Covington, Dec. 16, 1917.

Fontaria louisiana, sp. nov.

Type above dull brown; carinæ bright yellow.

Vestigial foveolæ 2+2.

Characterized by the structure of the gonopods of the male. In these the posterior or principal limb of the telopodite is bifid, the branches long, slender and subequal and cross those of the other gonopod; of the two branches or prongs the mesal one is geniculate near tip with the latter acute, while the ectal one is straight, its tip also acute. The proximal, undivided and less chitinous, stalk is thick, densely hairy, and is prolonged along the mesal side of the mesal prong. The anterior or lesser spine is much shorter than the bifid branch; it is much narrowed distad, is moderately sigmoidally flexed, and crosses that of the other gonopod.

The body is narrowed at both ends between which the sides are subparallel. The caudal plate short, truncate at tip. Processes of penultimate keels distally rounded, the other acute.

Length (male) 50 mm.

Locality.—Louisiana; Covington, Dec. 16, 1917.

A LONG-FASTING LEPIDOPTER.

BY R. R. ROWLEY, LOUISIANA, MO.

On May 15th, 1915, I received from Miss Harriet Boyes, of San Benito, Texas, twenty-four cocoons of *Rothschildia jorulla*, which she informed me were collected during the previous winter and spun by larvæ of the autumn of 1914.

The record for emergence of imagos is as follows: October 14th, 1915, one male moth; October 9th, 1916, one male; October

10th, 1916, one male; October 16th, 1916, one female; July 19th, 1917, one female; September 20th, 1917, one male; April 25th, 1918, one female; May 2nd, 1918, one male.

Two cocoons gave large wasp-like hymenopters, five contain dead chrysalids, three are doubtful, and six pupæ are still alive and will doubtless give imagos in the autumn, next spring and perhaps later.

Miss Boyes, as well as Miss Pattie Hutchinson, of Beeville, Texas, inform me they have had similar experiences with *jorulla* cocoons.

This coming autumn these cocoons will be four years old. Think of a macro-moth 4 years as a chrysalis!

I have had pupæ of *Automeris io* produce imagos on the second summer, of *Callosamia promethea* to do the same, and occasionally a few to live into the second winter, but have known only one butterfly to live two years as chrysalis, *Anthocharis genutia*.

Little danger of such insects becoming extinct, but four years between meals is a long time to go hungry.

ENTOMOLOGICAL SOCIETY OF ONTARIO.

Notice of Postponement of Meeting.

Owing to the epidemic of influenza it has been thought wise to postpone the annual meeting of the Society, and to hold it on Wednesday and Thursday, the 4th and 5th of December, instead of the 6th and 7th of November.

The place of meeting will be, as previously announced, the Ontario Agricultural College, Guelph.

It is expected that accommodation for all members can be secured in the residence at the College. Members who propose being present will kindly notify the secretary in advance, and also send as soon as possible the titles of their papers.

The Plant pathologists will meet on the Friday immediately following the Entomological Society meeting.

L. Caesar, President, O. A. College, Guelph, Ont.
A. W. Baker, Secretary, O. A. College, Gueph, Ont.

November, 1918

ON THE AMERICAN REPRESENTATIVES OF SOMATOCHLORA ARCTICA WITH DESCRIPTIONS OF TWO NEW SPECIES. (ODONATA).

BY E. M. WALKER, TORONTO.

Three North American species of Somatochlora have been described in which the appendages of the male are of the same general form as in the palæarctic species *S. arctica* Zetterst. These are *S. forcipata* Scudd., *S. semicircularis* Selys, and *S. franklini* Selys. Another species, *S. macrotona*, has been described by Williamson (Ent. News, XX, 1909, pp. 78–79) but, as mentioned below, I find this to be identical with *franklini*. To these three species I have two others to add, so that we have in North America five species of the *arctica* group. I had intended that the descriptions of these new species should first appear in a monograph of the American species of this genus, which is now in course of preparation, but at the request of another writer who wishes to list one of them I decided to publish them in advance.

The five North American species of Somatochlora of the *arctica* group may be separated as follows:

A. Superior appendages of ♂ with a prominent external tubercle beyond the middle, visible from above; vulvar lamina half as long as 9th sternite, bilobed; postclypeus wholly black.....*semicircularis* Selys.

AA. Distal external tubercle of superior appendages when present not or scarcely visible from above; vulvar lamina little or no shorter than the 9th sternite, entire; postclypeus variable.

B. Abdominal segments 5 to 7 with yellow latero-basal spots, greatest width of ♂ abdomen distal end of seg. 5, thence narrowing caudad.

C. Lateral thoracic spots brownish, scarcely paler than the ground colour, the mesepimeral elongate, ill defined; superior appendages of ♂ in profile straight, ventro-lateral tooth not affecting the outline; vulvar lamina extending almost or quite to the hind margin of 10th sternite.....*incurvate* n. sp.

CC. Lateral thoracic spots pale yellow; subovate, conspicuous; superior appendages of ♂ in profile arcuate, with a very prominent ventrolateral tooth, which affects the outline; vulvar lamina about as long as 9th sternite.....*forcipata* Scudd.

BB. Abdominal segments 5 to 7 without yellow spots, greatest width of ♂ abdomen at distal end of seg. 6 or beyond.

D. Frons bounded below by a yellowish margin, separating the metallic portion from postclypeus, the latter with yellowish lateral lobes; hind wing of ♂ but little shorter than abdomen (about 30:33), the anal triangle more or less yellow.....*kennedyi*, n. sp.

DD. Frons without a yellow inferior margin, the dark coloration continuous with that of postclypeus, which is wholly black; hind wing of ♂ decidedly shorter than abdomen (about 26:38), anal triangle with a brown spot.....*franklini* Selys.

Somatochlora semicircularis Selys.

This species seems to be wholly western, and is apparently the commonest species of the genus from the Rocky Mountains to the Pacific Coast. References to *semicircularis* from eastern localities (Williamson, Ent. News, April, 1906, p. 136, pl. V, figs. 2, 3, 4) apply to *S. kennedyi*.

S. semicircularis is easily recognized by the form of the male abdominal appendages and the vulvar lamina of the female, together with the black lateral lobes of the clypeus. The lateral thoracic spots are conspicuous in young individuals but of a deeper yellow than in *forcipata*, and the metepimeral spot is usually much smaller. Lateral abdominal spots are generally present but are variable and sometimes absent. The extent of these variations are well shown by Kennedy (Proc. U. S. Nat. Mus., 46, 1913, pp. 111–126, figs. 1–57). It is the stoutest of the five species of the group.

Material studied.—68 ♂'s, 21 ♀'s; Banff, Alta., June 29–31, 1913, 5 ♂'s 2 ♀'s, (Walker and Kurata); Nordegg, Alta., 6,500 ft., July 16, 1917, 1 ♂, (F. C. Whitehouse); Mt. Benson, Vancouver Is., B.C., July 21, 1909, 4 ♂'s 1 ♀; id., July 23, 1909, 1 ♀, (A. G. Huntsman); Departure Bay, Vanc. Is., July 13, 1908,

4 ♂'s 2 ♀'s, (Huntsman); near Lonely Lake, Vanc. Is., July 19, 1913, 6 ♂'s 2 ♀'s, (Walker and Kurata); Ainsworth, B.C., July 11, 1903, 1 ♂, (R. P. Currie, U.S.N.M.); Bumping Lake, Wash., July 10–11, 1911, 37 ♂'s 12 ♀'s, incl. 7 prs. in cop. (C. H. Kennedy, U.S.N.M.); Big Meadows, Or., July 7–8, 1913, 6 ♂'s, (Kennedy); Snake River, Yellowstone National Park, Aug. 14, 1896, 1 ♂, (Currie, U.S.N.M.); "Mountains, S. W. Colorado," Aug. 15–Sept. 6, 3 ♂'s 1 ♀ (Lieut. Carpenter, coll. Calvert, 1 ♂ coll. Walker).

Somatochlora incurvata, n. sp.

Male.—Occiput, frontal vesicle and upper part of frons metallic blue-black; sides of frons and lower margin ochreous to brownish yellow; postclypeus black in middle, lateral lobes castaneous; labrum black; anteclypeus and labium pale yellow; pile moderately dense, blackish on metallic areas, elsewhere pale brownish.

Prothorax dark greyish-brown, anterior lobe broadly edged with whitish, posterior lobe brownish ochreous. Meso- and metathorax metallic blue to violet, sometimes with greenish reflexions, with the following parts reddish brown; antealar sinus, inferior half of mesepisternum, an area along bases of wings extending as a stripe down the mesepimerum, an obscure, ill-defined area enclosing the metastigma and a large spot on the metepisternum, which is angular above when well defined. The mesepimeral and metepimeral spots are generally lighter than the other brown areas. Fore coxæ black in front, reddish brown behind, this colour extending over most of the outer surface of the fore femora. Pile of thorax rather thin, especially on the sides, pale brown.

Wings hyaline, the faint yellow tinge deepening in the anal triangles; pterostigmata castaneous, not very dark; costal veins dark brown, edged with dull ochreous toward the base; membranule dull dark brown, paler in basal third.

Abdomen slender, elongate, expanding from the constriction at seg. 3 to the distal end of seg. 5, narrowing gradually on 6, more rapidly on 7 and 8. Pile pale brownish, scanty. Genital lobes rather small, rounded angulate, incurved.

Colour greenish black, moderately shining. Segments 1, 2 and base of 3 castaneous, somewhat lighter on the sides and dorsal

surface of 2, but not forming distinct spots in the specimens studied. Base of 3 with lateral yellowish patch extending from dorsal to ventral surface. Segs. 4 to 8, each with a roundish, baso-lateral spot becoming small on 8.

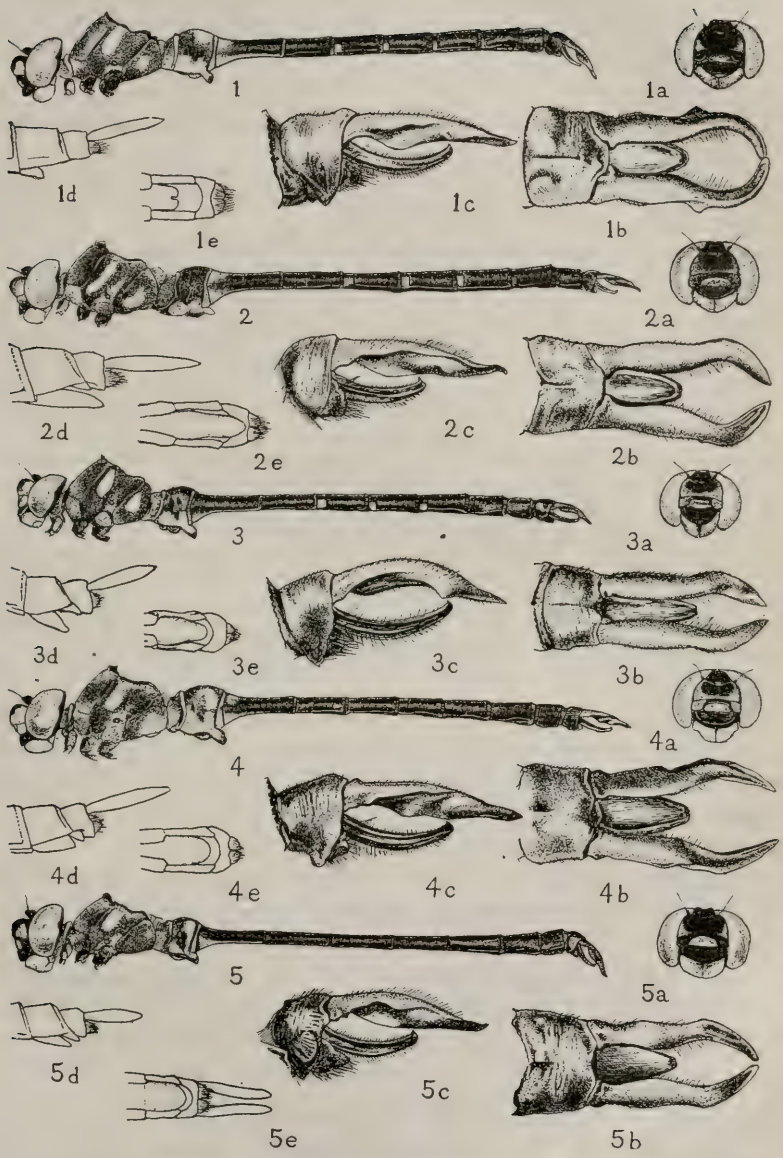
Appendages.—The form of these is shown on pl. X, figs. 2b, 2c. In dorsal view the superior appendages appear widest at the base, where they are close together, subparallel in proximal half, the apical inward curve nearly as in *semicircularis* but not quite so regularly arcuate. In profile they are straight, lateral carinæ percurrent, inferior carinæ gently arcuate towards base, slightly bent outward, but not visible from above; ventro-lateral prominence well marked, barely seen from above (probably not in all cases); apices acute, slightly carinate above, the extreme tips somewhat decurved (perhaps in drying). Inferior appendage about half as long as superiors, triangular, apex bluntly pointed, with a well-marked recurved spine.

Female.—Similar in coloration to male. Seg. 2 is entirely castaneous, except a very small lateral spot and an apical ring, which are pale brownish grey or drab. The underside of 3 is also of about the same colour. The yellow spots on the other abdominal segments are usually larger than in the ♂, and often diffusely prolonged caudad.

The wings as usual show considerable variation in colour but are typically hyaline, each with two basal, amber, yellow streaks, and a yellowish cloud occupying the distal half, or less, of the wing and deepest about the pterostigma. In some individuals the entire wing is flavescent, but even in these the basal streaks appear deeper than the rest of the wing.

In most of the specimens the abdomen is broadest at base and tapers fairly regularly to near the caudal extremity, but, as in other species, its form varies with age, younger individuals being more depressed and regularly tapering, older ones more cylindrical and laterally constricted at seg. 3.

The vulvar lamina is elongate, extending in all the specimens well beyond the distal margin of the 9th sternite, as far as that of 10 or even a little farther. It is horizontal, trough-shaped, the sides slightly convergent, apex broadly rounded, upper edges before the apical curve slightly arcuate. Inferior surface in profile



NORTH AMERICAN SPECIES OF SOMATOCHLORA OF THE *ARCTICA* GROUP.

feebly convex. Colour yellowish, darkened in the middle. Appendages about as long as vulvar lamina or as segs. 9 and 10 together.

VENATIONAL DETAILS. (2 ♂'s 10 ♀'s.)

	No. of veins	No. of wings, ♂	No. of wings, ♀		No. of veins	No. of wings ♂	No. of wings ♀
Antecubitals fore wings	7 8 9	 2 2	3 = 15% 16 = 80% 1 = 5%	2nd postc. before pter., fore wings	3 4	4 4	17 = 85% 3 = 15%
Antecubitals hind wings	5 6	2 2	18 = 90% 2 = 10%	2nd postc. before pter., hind wings	3 4 5	 4	4 = 20% 14 = 70 2 = 10%
Postcubitals fore wings	5 6 7	 4	6 = 30% 10 = 50% 4 = 20%	Veins in triangle, fore wings	0 1	 4	2 = 10% 18 = 90%
Postcubitals hind wings	6 7 8 10	 1 3	2 = 10% 12 = 60% 5 = 25% 1 = 5%	Veins in triangle, hind wings	0 1	 4	2 = 10% 18 = 90%

*Measurements**.—(2 ♂'s, 10 ♀'s)—Length (without apps.) ♂ 52.0–54.5, ♀ 47.5–56.5; thorax, ♂ 8–9, ♀ 7.5–8.5; abdomen (without apps.), ♂ 38.0–39.5, ♀ 35.0–43.0; hind wing, ♂ 33.0–34.0, ♀ 32.0–36.5 ; sup. apps. ♂ 4 ; apps. ♀ 3.0–3.75; pterostigma of hind wing (costal margin), ♂ 2.75–3.0, ♀ 2.8–3.5; width of hind wing, ♂ 9.25–10.0, ♀ 9.0–10.3; width of head, ♂ 7.6–8.0, ♀ 7.0–8.0.

Holotype.—♂ Whitefish Pt., Chippewa Co., Mich., July 29, 1916 (A. F. Combs). *Allotype.*—♀, same data. Both in the University of Michigan Museum, Ann Arbor, Mich. *Paratopotypes.*—1 ♂ 2 ♀'s Aug. 7, 1916; 6 ♀'s July 29, 1916; 1 ♀ Aug. 4, 1916, 1 ♀ without date. Total 2 ♂'s 11 ♀'s.

This species is a very close relative of *S. forcipata*. Its average size is larger and the lateral thoracic spots differ in shape and colour, otherwise the colour pattern approaches that of *forcipata* closely. The superior appendages of the ♂ appear in profile more like those of *kennedyi* than *forcipata* and, as in the former the inferior appendage is only about half the length of the superiors. The vulvar lamina is decidedly longer than in any other species.

Somatochlora forcipata Scudder.

This slender, dark-coloured species is rather widely distributed but seems to be everywhere rare. It ranges from New-

*All measurements are in millimetres.

foundland and Labrador to Great Slave Lake and southward to Nova Scotia, northern New England, Quebec, Ontario and northern Michigan. I have seen but nine specimens from the following localities:

Hopedale, Labrador, Aug., 1917, 1 ♂, (W. W. Perrett) Ashwanipi River, Northern Quebec, July 25, 1917, 1 ♀, (Carnegie Museum Coll.); Isle d'Orleans, Que., Aug. 27, 1904, 1 ♂, (Walker); Algonquin Park, Ont., July 15, 1900, 1 ♂, (J. Macoun); De Grassi Pt., Ont., June 26, 1918, 1 ♂, (Walker); Profile Lake, N. H., July 20, 1918, 1 ♂, (R. H. Howe); Manistiqua River, Schoolcraft Co., Mich., 2 ♂'s, (A. F. Combs); Marquette, Mich., 1 ♀, (Coll. Hubbard & Schwarz, U. S. N. M.).

Somatochlora kennedyi, n. sp.

Male.—Occiput, frontal vesicle and upper part of frons metallic blue-black or green-black; sides of frons and a moderately broad, lower margin yellowish brown; postclypeus dark brown or black in centre, lateral lobes yellow; labrum black or deep brown, anteclypeus and labium pale yellow. Pile somewhat dense, blackish on top of head, pale yellowish on face. Rear of head black with whitish pile.

Prothorax greyish brown, anterior lobe edged with whitish, posterior lobe testaceous. Meso- and metathorax metallic gold-green with blue reflexions, the actual brilliancy of the colour much obscured by dense, light brownish pile; the following parts ochreous but not forming well-defined nor conspicuous spots:—the antealar sinus, the ventral edges of the mesepisternum, a narrow area below bases of wings, an oblong or ovate spot on the mesepimerum connected with the above area, an ill-defined blotch enclosing the metastigma, and the posterior half or more of the metepimerum. Fore coxæ black in front, dull yellowish above and behind, this colour extending over trochanters to outer surface of fore femora in their basal half.

Wings hyaline or tinged with yellow, especially along costa, sometimes entirely suffused with amber yellow; costa yellowish proximally, darkening beyond nodus; pterostigmata dark yellowish brown; hind wings with a yellow basal spot of variable size and

depth of colour, but not extending much beyond the anal triangle; membranule dark smoky brown, the basal third or fourth paler.

Abdomen greatly constricted at seg. 3, slender and scarcely expanding on 4, thence gradually widening to the distal end of 6 or even that of 7, beyond which it is considerably narrowed again. Pile pale brownish, long and thick on segs. 1 and 2, elsewhere very short. Genital lobes large, subangulate below, moderately incurved, with dense pile.

Colour greenish black, but little shining, marked with dull yellow as follows: Seg. 1, a large lateral spot. Seg. 2, a large antero-ventral and usually a postero-ventral spot on each side, narrowly separate or connected, the latter extending upon bases of auricles; a pair of large, rounded postero-dorsal spots, which may be narrowly connected with the postero-ventral spot, and a pale, apical annulus. Seg. 3, a pair of small, antero-dorsal spots and larger paler antero-ventral spots, continued caudad as narrow marginal streaks. The remaining segments have no pale markings except the brownish streaks along the tergal margins on the ventral surface.

The abdominal appendages (pl. X, figs. 4b, 4c) differ from those *forcipata* as follows: The superior appendages are less arched in profile with a less prominent distal ventro-lateral prominence; the lateral carina extends farther distad and gives a broken appearance to the outer margin in dorsal view, the apices are more acute. The inferior appendage is a little shorter. The broken outer margin and acute apices also distinguish the appendages from those of *incurvata* and *semicircularis*, the latter differing also in other points already noted.

Female.—Similar to male in coloration with the following slight differences: Abdominal segment 2 with a single large pair of ventro-lateral spots and a pair of postero-dorsals, or these may fuse to form one large lateral blotch. Seg. 3 with antero-dorsal spots much larger and broadly connected with the antero-ventral spots. The basal yellow spot of the hind wings may be very small or indistinct.

The shape of the abdomen varies much according to age, and is similar to that of *incurvata*. Vulvar lamina about four-fifths as long as 9th sternite, not elevated, spoon-shaped, broadest at

base, but little narrowed distad, the free margin entire, broadly rounded, colour yellowish.

VENATIONAL DETAILS. (10 ♂'s 10 ♀'s.)

	No. of veins	No. of wings, ♂	No. of wings, ♀		No. of veins	No. of wings, ♂	No. of wings, ♀
Antecubitals, fore wings.	7	11 =55%	11 =55%	Antecubitals hind wings.	4	1 =5 %	
	8	9 =45%	8 =40%		5	17 =85%	19 =95%
	9		1 =5 %		6	1 =5 %	1 = 5%
					7		
					8	1 = 5%	
Postcubitals, fore wings.	5		6 =30%	Postcubitals, hind wings.	5	1 = 5%	2 =10%
	6	12 =60%	6 =30%		6	1 = 5%	2 =10%
	7	4 =20%	8 =40%		7	8 =40%	12 =60%
	8	4 =20%			8	7 =35%	3 =15%
					9	2 =10%	
					10	1 = 5%	1 = 5%
Triangles fore wings	0			Triangle hind wings	0	7 =35%	4 =20%
	1	20 =100%	20 =100%		1	13 =65%	15 =75%
	2				2		1 = 5%

Measurements.—10 ♂'s 10 ♀'s. Length (without apps.) ♂ 46.5–51.0, ♀ 46.0–52.0; thorax, ♂ 8.5–9.0, ♀ 7.0–8.0; abdomen (without apps.), ♂ 33–36, ♀ 34–38.5; hind wing, ♂ 30–31.5, ♀ 30–32.5 ; sup. apps. ♂ 3.6–4; apps. ♀ 3.4–4.3 ; pterostigma of hind wing, ♂ 2.5–3, ♀ 2.5–3; width of hind wing, ♂ 8.5–9, ♀ 9–10; width of head, ♂ 7–7.5, ♀ 7.25–7.6.

Holotype.—♂, Orono, Me., F. L. Harvey, collection of Dr. P. P. Calvert. *Allotype.*—♀, Orono, Me., F. L. Harvey, collection of Dr. P. P. Calvert ; taken in cop. with holotype. *Paratopotype.*—♂, June 15, 1891, Harvey, collection of Dr. Calvert.

I have also examined the following specimens: Orono, Me., June 18, 1898, Bartle Harvey, 1 ♀, (U. S. Nat. Mus.); Manchester, Me., Miss M. Wadsworth, June 20, 1904, 1 ♀, (coll. Calvert); Concord, Mass., R. H. Howe, June 18, 1917, 1 ♀, (teneral); id., June 24, 1917, 2 ♂'s 1 ♀ ; id., June 4, 1917, 1 ♀ ; id., June 4, 1918, 1 ♂ 1 ♀ ; id., June 6, 1918, 1 ♂ 1 ♀ ; id., June 9, 1918, 1 ♂; Manistiqua River, Schoolcraft Co., Mich., 2 ♂'s, (A. F. Combs); Godbout River, Quebec, July 29, 1918, 1 ♂ 1♀, (Walker); Mer Bleue, near Ottawa, Ont., June 9, 1903, 2 ♂'s 2 ♀'s, (A. Gibson); De Grassi Pt., Lake Simcoe, Ont., June 19, 1917, 1 ♂, (Walker). Total 13 ♂'s, 11 ♀'s.

This species has been confused with both *forcipata* and *semicircularis*. Eastern records of this latter species all belong to

kennedyi. The untangling of the synonymy, however, can be omitted here, as it will be considered in my revision of the genus, now in preparation.

I take pleasure in naming this species after Mr. Clarence Hamilton Kennedy in recognition of his valuable contributions to North American Odonatology. Mr. Kennedy recognized this species as distinct independently of the writer and at about the same time, so that it is particularly fitting that it should bear his name.

Somatochlora franklini Selys.

This species is remarkable for the great length and slenderness of the abdomen and shortness of the wings in the male, and to a less extent in the female. There is much variation in these characters, and also in size, coloration of wings and length of appendages of the ♀.

A study of this species in considerable series shows that *S. macrotona* Wmsn. (Ent. News, Feb., '09, pp. 78–79) is not distinct from *franklini*, the characters employed to separate the two forms being very variable, especially in the female. The principal character upon which the specific diagnosis of *macrotona* was based is the presence of small genital lobes in the ♀, these being absent in *franklini*. I find these lobes are sometimes present as an individual variation, but are independent of the other characters given for *macrotona*. They show various degrees of development, being sometimes barely indicated.

There is some doubt as to whether the present species is the true *franklini* of Selys. In case it proves to be a distinct species, the name *macrotona* will still be valid.

S. franklini is the most widely distributed species of this group, and is characteristic of the Hudsonian and Canadian zones from Labrador, Newfoundland and Maine to the Rocky Mountains, probably ranging to the Pacific Coast.

I have examined the following material: Hopedale, Labrador, Aug., 1917, 1 ♀, (W. W. Perrett); East Main, Hudson Bay, Que., July 8, 1914, 2 ♀'s, (W. Todd); Sherbrooke, Que., 1 ♀, (Abbè Begin); Mer Bleue, near Ottawa, Ont., June 9, 1908, 1 ♂, (A. Gibson); Western Ont., Hudson Bay drainage, July 21, 1917, (Mrs. G. K. Jennings), 1 ♀; Winnipeg, Man., June 16, 1910,

1 ♂ 1 ♀, (J. B. Wallis); Winnipeg Beach, Man., June 19, 1909, 1 ♀, (Wallis); Husavick, Man., Aug. 17, 1910, 1 ♀, (Wallis); Le Pas, Man., July 1, 1917, 1 ♂ 2 ♀'s, (Wallis); Hudson Bay Railway, various points from M214 to M332, July 7–19, 1917, 4 ♂'s 7 ♀'s, (Wallis); Nordegg, Alta., July 11–17, 1917, 5 ♂'s 17 ♀'s, (F. C. Whitehouse); Chemo Stream, Bradley, Me., July 27, 1891, 1 ♂, (F. L. Harvey); Whitefish Point, Chippewa Co., Mich., Aug. 4, 1916, 1 ♂; id., no date, 2 ♂'s, (A. F. Combs). Total 16 ♂'s, 34 ♀'s.

Explanation of Plate X.

Fig. 1—*Somatochlora semicircularis* Selys, ♂ (legs and wings omitted); 1a, front view of head; 2b, abdominal appendages of ♂, dorsal view; 1c, same, lateral view; 1d, end segments of ♀, lateral view; 1e, same, ventral view (appendages omitted).

Figs. 2—2e, *Somatochlora incurvata*, n. sp., same parts in fig. 1-1e.

Figs. 3—3e, *Somatochlora forcipata* Scudd., same parts as in figs. 1-1e.

Figs. 4—4e, *Somatochlora kennedyi*, n. sp., same parts as in figs. 1-1e.

Figs. 5—5e, *Somatochlora franklini* Selys, same parts as in figs. 1-1e.

ZOROTYPUS HUBBARDI, A NEW SPECIES OF THE ORDER ZORAPTERA FROM THE UNITED STATES.

BY A. N. CAUDELL, BUREAU OF ENTOMOLOGY, U. S. DEPT. OF AGRICULTURE, WASHINGTON, D.C.

For over two decades a very unusual termitophilous inquiline has remained unstudied in the National Collection in spite of its having been several times brought to the attention of men better fitted to publish upon it than myself. It seems wrong to neglect longer the recording of this interesting addition to our fauna, and especially the interesting notes made by Mr. H. G. Hubbard, the original discoverer of the species, and I have, therefore, decided to assume the responsibility for the new name here erected. In

my studies I have benefited greatly from advice and assistance from various of my office associates. At an opportune moment, just as I was studying the Hubbard material, there came to hand an additional lot of six specimens taken but a month previous by Mr. Snyder. This accession of fresh material proved of great value.

It was in 1895 that this insect was first discovered, Mr. Hubbard collecting material at Haw Creek, Florida, in March of that year. Specimens were taken in termite galleries in a decayed log, and field notes were made on their appearance and habits. Except for an extract published by T. E. Snyder, Bull. Bur. Ent., U. S. Dept. Agric., No. 94, part II, p. 71 (1915), these notes are still in manuscript. Deeming them well worth printing I here quote them in full:

"Termitophilous insects Haw Creek, Fla., March 4, 1895, (*Trichopsenus?* and a Thysanuran near *Campodea* imitating a young termite) found in galleries of *Termes flavipes*, small var., living in large, red rotten log in palmetto hammock. The *Campodea* lives in galleries not among the termites but in their immediate vicinity. It can only be distinguished from the immature termite by its longer legs and greater activity. It is very difficult to capture. I saw several, got only one in small vial of alcohol.

"March 26 from same log I took numerous specimens of the Thysanuron, but lost one vial and saved only a few specimens, one of which is mounted on a point, the rest in alcohol tube.

"May 16. I mounted in balsam on a slide two specimens, one on its back and one on its belly. The balsam clouded considerably."

The *Trichopenus?* mentioned in the above quoted notes is a Staphylinid beetle.

Some time later, the exact date not known and of little importance, the above notes were rewritten by Mr. Hubbard in a more permanent form and show a change of opinion as to the probable identity of the species concerned. This recasted note is here copied in full:

"247 Termitophilous Psocid found with termites in large log in pine swampy hammock of Prairie Farm, Haw Creek, Fla.,

March 26, 1895. Several specimens in alcohol together with worker of the termite collected at the above date, also one specimen dry on triangle point, collected March 4, '95, from the same log. The resemblance to a young termite is perfect, especially in mature specimens like that mounted dry. The psocid is, however, much more active than the termite and very difficult to capture. Immature specimens were not rare, and I took a large number but lost most of them with the vial that contained them. The immature specimens inhabit the galleries of the termites, but are not so apt to be found among the termites themselves as in their immediate vicinity. No. 244 *Microcpytus testaceus* was taken from this log at the same time.

"[4]Balsam slide with two specimens of the Psocid.

"In the spring of 1896 I visited this log and found the vial with specimens lost the previous year. These are in separate vial (alc) numbered 247[a]. The termites from this same collecting vial are in a separate vial and numbered 707."

The lost vial mentioned in this note has again been lost track of and its whereabouts is at the present time unknown.

The recently acquired material was taken in Florida by Mr. T. E. Snyder, who has kindly furnished the following field note regarding them:

"15290[a]. Miami Beach, Fla., April 10, 1918. Inquilines? With termite in decayed red mangrove log; with termite and in adjacent wood. Very much more active than the termite."

The above material, ten specimens in all, four from Hubbard and six from Snyder, forms the basis for the following description:

Zorotypus hubbardi, new species.

General habitus very like that of a termite. Entire insect beset with stout, inclined bristle-like hairs, those on the dorsal surface of the abdomen directed backwards and mostly arranged in two transverse rows on each segment, one post-mesial and one at the posterior margin. A few of these bristles towards the end of the abdomen are sometimes quite long, almost as long as the basal segment of the antenna, but for the most part they are less than one-half that long and those of the sides and especially on the venter of the abdomen are very small and short. These

bristly hairs are scattered over the entire insect, body and appendages, including even the palpi, those on the legs and other appendages smaller and shorter, some on the antennæ being somewhat longer and a few on the coxæ as long as or even longer than the average ones on the dorsum of the abdomen, but less stout.

Head from above about as long as broad, without a prominent nasus as common in wingless psocids. Antennæ thick and consisting of nine segments; basal segment large, the apical four-fifths swollen, the entire segment almost three times as long as the greatest width; second and third segments approximately a third narrower than the first and subequal in length, their combined length scarcely as much as that of the basal segment; fourth to ninth segments about the same thickness and length as the basal one, the fourth slightly shorter, and the ninth somewhat more pointed apically than the others. Mandibles subquadrate and heavily chitinized, with two major teeth and some smaller notches and with a few fine hairs on the outer side; between the mandibles and the antennæ is the clypeus, which is small and narrow, making the antennæ but little separated from the base of the mandibles; maxillæ large and well developed, from a side view forming no inconspicuous feature of the head in fresh material or specimens preserved in spirits, the tip pointed and chitinized and with several moderately long teeth and some short brush-like bristles; maxillary palpi consisting of five segments; basal segment short and generally inconspicuous, little longer than broad; second segment of about the same thickness as the basal one, thickening somewhat in about the apical two-thirds and about four times as long as the greatest width; third segment about as long as the second but a little thicker; fourth segment but little longer than the apical width, apically about as thick as the preceding segment but basally much narrowed, the tip concave; fifth and last segment noticeably longer than any of the preceding ones, nearly as long as third and fourth together, and somewhat thicker than any of the preceding ones, the margins very slightly rounded and the tip broadly rounded; labial palpi three-segmented, the basal two short and generally obscure and the apical one large and thick, being nearly as thick as the terminal segment of the maxillary palpi, and but a little shorter, the whole segment about three

times as long as the greatest width. Eyes wanting, two specimens on a slide in balsam showing pigmented lateral spots which may represent eye facets. Ocelli wanting.

Thorax well developed; pronotum from dorsal view about as long as broad, about as long as the meso- and metathorax combined, and very broadly rounded anteriorly and truncate posteriorly the sides very gently rounded and gradually convergent posteriorly where it is nearly a fourth narrower than anteriorly, the length about equal to the anterior width; mesonotum from above half as long as the pronotum and posteriorly broadly rounded, the sides straight and gradually divergent posteriorly, where the width is slightly greater than that of the posterior part of the pronotum; metanotum similar to the mesonotum in length and shape but a little broader.

Legs stout, coxæ very large and broad, being fully as broad as the femora; trochanters well developed, being of about the thickness of the apical tarsal segment and a little longer than broad; femora stout and decidedly swollen, about four times as long as broad and beset with small bristles except on the inner surface, which is naked, otherwise unarmed except the posterior ones, on the inferior caudal margin of which there are two black chitinized teeth, one at the basal and apical thirds; the hind femora are somewhat larger than the others and have eight or nine bristles on the lower margin in addition to the two larger chitinized teeth; tibiæ less than one-half as thick as their respective femora and of about the same length except the posterior ones, which are somewhat longer than the corresponding femora; the tibiæ are beset on every side by short bristles but are otherwise unarmed; the anterior ones on the anterior inferior margin with a series of a score or more bristles; tarsi consisting of two segments, the basal one triangular and very minute, the second one large, somewhat less thick than the tibiæ, about five or six times as long as broad and beset all over with short bristles which, like those on the tibiæ and femora, are not erect but considerably inclined. Claws two in number on each foot, slender, as long as the thickness of the terminal tarsal segment and abruptly curved at a right angle at about the basal fourth.

Abdomen but little flattened, from a dorsal view decidedly

broader mesially and apparently consists of seven dorsal segments in the female and eight in the male; apically there is a pair of short, thick, fleshy, unsegmented cerci, as thick as the basal segment of the antenna, a little longer than broad, apically moderately narrowly rounded and, like the rest of the insect, bearing bristly hairs, four or five at the tip being unusually long, the apical one being sometimes even as much as twice as long as the cercus itself; genitalia usually concealed, in alcoholic material some males have a somewhat chitinized compressed organ more or less exserted. A detailed study of the genital characters was scarcely possible with the material at hand.

Entire length from front of head to tip of abdomen two mm., of pronotum three-eighths mm.; of hind femora seven-twelfths mm.; antennæ one and one-third mm.

Described from a total of ten specimens; one male on card point, one female in alcohol and two specimens, probably male nymphs, in balsam on a slide, taken by H. G. Hubbard in galleries of *Leucotermes flavipes* Kol. at Haw Creek, Fla., on March 26, 1895; four males, one female and one mutilated specimen of doubtful sex, all in spirits, taken by T. E. Snyder, at Miami Beach, Fla., April 10, 1918, in galleries of a termite of a different genus and species than the above.

Type, male; allotype, female, from material taken by Snyder. These two specimens are preserved in a hermetically sealed tube of spirits.

Type U. S. N. M. Cat. No. 21835.

The above described species is related to *Zorotypus neotropicus* Silvestri from Costa Rica, but seems a little larger, and the proportionate length of the basal segment of the antenna is different and the number of setæ on the lower margin of the anterior tibiæ appear to be greater. The description of *neotropicus* makes no mention of the two chitinized teeth on the inferior caudal margin of the posterior femora, a character present in *hubbardi* and one scarcely likely to have been overlooked by Silvestri, and thus presumably not present in the Costa Rican species.

The Order Zoraptera was established by Silvestri* for the

*Bollet. Lab. Zool. Gen. Agr. Portici, vol. VII, p. 193–209, figs, I–XIII (1913.)

single genus *Zorotypus* containing three species, *guineensis* from Africa, *ceylonicus* from Ceylon and *javanicus* from Java. Excellent figures showing the general appearance and details of these interesting insects are given by the describer. Later* the same writer described a new species from the New World, *Z. neotropicus* from Costa Rica. Melander and Brues, Key to the Families of North American Insects, Plate 2, Fig. 26, copy one of Silvestri's figures showing the general appearance of *Zorotypus*.

Silvestri compares the Zoraptera with the Isoptera and with the Blattidæ and mentions the Dermaptera in this relation, but did not seem to consider any possible relationship with the Psocidæ. Thus it seems somewhat odd that they should have been considered psocids by Mr. Hubbard and others. The rapidity of movement was probably responsible, as structurally little similarity to Corrodentia seems to exist. The presence of cerci, the situation of the antennæ near the base of the mandibles and especially the general appearance show a wide divergence from the psocid type but a near relationship to termites.

NEW NEARCTIC CRANE-FLIES (TIPULIDÆ, DIPTERA). PART VI.

BY CHARLES P. ALEXANDER, LAWRENCE, KANS.

Dicranomyia rhipidioides, new species.

Antennæ black, moniliform ; general coloration brownish yellow, the præscutum with three dark brown stripes; wings grayish with sparse brown spots and subhyaline drops; *Sc* short, cell *1st* M^2 closed, elongate.

Male.—Length about 5.2 mm.; wing 6.9 mm.

Rostrum and palpi dark brown. Antennæ black, the flagellar segments moniliform, subglobular. Head dark.

Thorax pale brownish yellow, the præscutum with three dark brown stripes, of which the median stripe is very broad, the lateral stripes narrow, continued backward so as to suffuse the scutal lobes; postnotum darker. Pleura light yellowish brown. Halteres

*Id, vol. X, p. 120 (1916.)

short, pale. Legs with the coxæ pale yellowish brown; trochanters and femora dull yellow, the tips of the latter narrowly dark brown; tibiæ yellowish brown, passing into dark brown at about mid-length; tarsi brown. Wings strongly tinged with gray, sparsely marked with brown and subhyaline; small brown spots and seams at the arculus, origin of the sector, along the cord, and the outer end of cell *1st* M^2; stigma pale, rectangular; subhyaline drops as follows: before and beyond the stigma; end of cell R^5; cell *1st* M^2; a few small droplets in cells *M*, *Cu*, and *1st A*. Venation: *Sc* short, ending opposite the origin of the sector; Sc^1 slightly retracted from the tip of Sc^1; *Rs* long, strongly arcuated at origin, about twice the length of the deflection of R^{4+5}; *r* at the tip of R^1; cell *1st* M^2 very long, closed; outer deflection of M^3 about twice the length of *m*; M^3 beyond *m* but little longer than that portion of the vein before *m*; basal deflection of Cu^1 just beyond the fork of *M*.

Abdominal tergites dark brown, the caudal margins of the segments pale; sternites pale brown. Hypopygium with the pleurites long and slender, about twice the length of the appendages; ventral pleural appendage terminating in a slightly curved cylindrical point.

Habitat.—California.

Holotype.—♂, Alameda, Cal., May 26, 1915, (M. C. Van Duzee).

This fly bears a superficial resemblance to *Rhipidia fidelis* O. S., but may readily be distinguished by the structural details.

Erioptera (Erioptera) pilipennis, new species.

Related to *E. laticeps* Alex.; wings with a sparse pubescence in the apical cells.

Female.—Length 3.2 mm.; wing 5 mm.

Rostrum, palpi and antennæ black. Head dark gray.

Thorax dark gray, the pleura a little brighter. Halteres pale. Legs with the coxæ and trochanters brownish yellow; femora dark brown, more yellowish basally; tibiæ and tarsi dark. Wings grayish; veins dark brown; a distinct though sparse pubescence in the centres of the apical cells from R^2 to Cu^1, inclusive. Venation: almost as in *E. laticeps* but *Rs* longer; R^{2+3} longer; *r*

inserted farther out on R^2 and closer to the tip of R^1; Cu^1 at the fork of M.

Abdomen dark gray; ovipositor horn-coloured.

Habitat.—Oregon.

Holotype.—♀, Hood River, Oregon, June 2, 1917, (F. R. Cole).

In our fauna this species resembles *E. laticeps*, from which it is readily separated by the sparsely pubescent wings, the venation and the coloration of the abdomen.

Erioptera (**Mesocyphona**) **needhami,** new species.

Related to *E. dulcis* O. S.; coloration pale grayish yellow, the mesonotum with four separated brownish stripes; legs white with a brown ring before the tips of the femora; tip of the tibiæ not darkened.

Length 4–4.2 mm.; wing 3.8–4 mm.

Rostrum and palpi dark brown. Antennæ yellow, the terminal segments of the flagellum a little darker. Head pale.

Thorax pale grayish yellow, the præscutum with four narrow, dark brown stripes, the median pair widely separated from one another, lying outside the tuberculate pits; lateral stripes on the margin of the sclerite. Pleura with two narrow, dark brown stripes enclosing a broad, silvery stripe; sternites silvery. Halteres pale, knobs brown. Legs with a broad, dark brown ring before the tips of the femora; remainder of the legs white excepting the slightly darkened last two tarsal segments. Wings grayish brown, dark brown on the anterior half, fading into grayish on the posterior half; a few large, whitish spots on the surface including the arculus, origin of Rs, Sc^2, Sc^1, R^1, R^2, along the cord and smaller spots near the tips of the other longitudinal veins.

Abdomen yellow, the segments marked with brown; hypopygium yellow; sternites with an interrupted dark brown lateral stripe and a less distinct but broader, pale brown median stripe.

Habitat.—Eastern United States.

Holotype.—♂, Sacandaga Park, Fulton Co., N.Y., June 17; 1910.

Allotype.—♀, with the type.

Paratopotypes.—Abundant specimens of both sexes.

This species is related to *E. dulcis* O. S. (Western United States) but is much paler, the legs white and completely lacking the dark tibial tips of *dulcis*. The fly is very common throughout the Eastern States. My distribution sheets indicate a wide distribution (Maine, Vermont, Connecticut, New York, Pennsylvania, New Jersey, Maryland, Virginia and North Carolina). The fly has hitherto been determined as *dulcis* by Mr. Johnson and the writer, but comparison with authentic specimens of *dulcis* show that it requires a new name, and I take great pleasure in dedicating the form to Dr. James G. Needham.

Gonomyia (Gonomyia) spinifer, new species.

Related to *G. cognatella* O.S.; thoracic pleura with a broad, dark brown stripe; abdominal tergites dark brown, tipped with yellowish; sternites yellow; male hypopygium with the ventral pleural lobes elongate, on the dorsal face before the tip with a sharp spine.

Male.—Length 3.8–4 mm.; wing 4.9–5 mm.

Female.—Length 3.8 mm.; wing 4.8 mm.

Rostrum and palpi dark brown. Antennæ with the scape light yellow, the flagellum dark brown. Head yellow.

Thorax yellow, the præscutum with three broad, brown stripes that are confluent behind. Pleura yellow with a rather broad, dark brown stripe extending from the cervical sclerites to the base of the abdomen and including the halteres; sternites dusky. Halteres pale. Legs dull yellow, the tips of the femora and tibiæ and the terminal tarsal segments a little darker. Wings pale gray; stigma indistinct, pale brown; veins dark brown. Venation: *Sc* short ending far before the origin of *Rs*, this distance a little longer than *r-m; R^{2+3}* arcuated, a little longer than the sector; veins R^2 and R^3 divergent at the wing-tip; cell *1st* M^2 open by the atrophy of M^2; basal deflection of *Cu1* before, at or just beyond the fork of *M*.

Abdominal tergites dark brown, the caudal-lateral angles of the segments yellowish; hypopygium yellowish; sternites light

yellow. Male hypopygium with the ventral pleural lobe elongate, fleshy, projecting far beyond the other appendages, on its dorsal face before the tip with a sharp, dark-coloured spine. Penis-guard narrow subtended on either side by a sharp, curved chitinized hook whose points are directed ventrad; these hooks are unequal in size, one being much smaller and feebler than the other; at its apex the guard ends in a slender dorsally curved hook. Female ovipositor with the valves long and straight.

Habitat.—California.

Holotype.—♂, Los Cerritos, Cal., March 19, 1915, (M. C. Van Duzee).

Allotype.—♀, with the type, March 14.

Paratopotypes.—2 ♂'s.

Tipula entomophthoræ, new species.

Mesonotal præscutum gray with three brown stripes; wings gray with a broad cross-band of white beyond the cord; vein R^2 persistent for its entire length; male hypopygium having the ninth tergite deeply notched medially, the lateral angles obliquely truncated.

Male.—Length about 18 mm.; wing 15.8 mm.

Frontal prolongation of the head elongate, yellow above, dark brown beneath and on the sides. Antennæ with the three basal segments brownish yellow, the remainder of the flagellum dark brown. Head gray with an indistinct, median brown line.

Thoracic pronotum gray, narrowly brown medially. Mesonotal præscutum light gray with three dark brown stripes that are centred with gray, the median stripe narrowed behind. Pseudosutural foveæ prominent. Scutum with two brown marks on each lobe; median lobe of the scutum and scutellum with a very narrow, brown line; postnotum yellowish brown. Pleura clear gray. Legs with the femora dull yellow, the bases brighter, the tips more infuscated; tibiæ and tarsi dark brown. Halteres broken. Wings brown, gray and whitish, cross-banded. A dark area at the arculus and cross-vein *h*, another at the origin of the sector, a large area at the stigma continued down to cell *1st* M^2;

apex of the wing brown including the apical half of cells R^2 and R^3, the apical two-thirds of cell R^5 and all of cells M^2 and *2nd* M^2; remainder of the wing grayish brown with a large, white cross-band beyond the stigma extending clear across the wing except the apex of cell M^3; a broad cross-band before the stigma and beyond the origin of the sector extending into cell *M;* a large white blotch in the base of *M* and the basal half of cells *Cu* and *1st A*. Venation: R^2 persistent for its entire length; petiole of cell M^1 short, a little longer than *m; m-cu* short but evident.

Abdomen dull yellow, the tergites and sternites with a broad, median brown line. Pleural region and sides of the sternites brownish. Hypopygium brown. Male hypopygium with the ninth tergite large, sub-quadrate, the caudal margin with a deep U-shaped notch, this latter medially with a still smaller but similar notch; lateral angles obliquely truncated. Ninth pleurite complete, large, the ventral portion with dense long setæ; outer pleural appendage narrow at base, expanded into a flatted blade which is covered with numerous long stiff setæ; inner pleural appendage terminating behind in a scoop-like lobe that is two-toothed, the inner tooth longest and acutely chitinized, the convex lower surface with long, pale hairs; anteriorly the blade is white, very flattened, the outer edge heavily chitinized, jet-black, the tips expanded, in a position of rest lying beneath the ninth tergite. Ninth sternite with a deep, median notch behind which is a membranaceous area; margin of the sternite adjoining the pleurite setigerous, the posterior portions smooth.

Habitat.—North Carolina.

Holotype.—♂, Cranberry, N. Car. (Roland Thaxter.)

Paratopotype.—♂, in the author's collection.

This species is related to *T. angulata* Lw, *T. penobscot* Alex., *T. subfasciata* Lw., etc., but is separated from all by the structure of the male hypopygium and from the last two species by the complete vein R^2. The material was heavily infested with the type-material of *Entomophthora caroliniana* Thaxter. The type and two additional specimens have been placed in the M.C.Z. collection by Dr. Thaxter.

(To be continued)

THE OTTAWA NATURALIST.

To the officers of the Ottawa Field-Naturalists' Club we extend our hearty congratulations on the great improvement in the appearance of the new volume of its organ, THE OTTAWA NATURALIST. The size is considerably larger, the number of pages increased, while the quality of the paper is vastly superior, being adequate to the needs of the best half-tone illustrations, as shown by the excellent plate of photographs of mushrooms, accompanying Mr. F. W. Waugh's article on "Wild Plants as Food." The magazine also gains in appearance by the attractive design on the cover.

THE OTTAWA NATURALIST, which was established in 1887, is one of the oldest natural history periodicals in North America. It is the only Canadian magazine whose scope extends to all branches of the subject, and it should, therefore, receive the hearty support of nature lovers, teachers and educational institutions throughout the country; as without an adequate subscription list it cannot be expected to maintain the high standard it has now reached. The subscription price, one dollar per year, remains unchanged, and for this small sum a volume consisting of nine numbers is offered.

In the wider sphere of usefulness upon which it is entering we wish THE OTTAWA NATURALIST a long and successful career.

BOOK NOTICE.

Report of the Proceedings of the Second Entomological Meeting, held at Pusa on the 5th to 12th February, 1917. Edited by T. Bainbrigge Fletcher, F.L.S., F.E.S., F.Z.S., Imperial Entomologist, Calcutta, 1917. Rs. 3 or 4s. 6d.

This volume does not consist of a series of separate contributions from different writers but is virtually a summary or abstract of the current knowledge of the insects injurious to Indian crops of all kinds, based upon notes prepared before the Meeting by the Imperial Entomologist and the discussions of these which took place at the Meeting.

To the general reader and those unfamiliar with the peculiar problems that confront the economic entomologist in India, the introductory remarks by Mr. Fletcher will be found interesting. He gives much sound advice on the need of exactness in the making of observations and recording of data. The life-histories of most Indian insects are as yet very imperfectly known, and there are gaps in our knowledge of the life cycles of some of the commonest species, such as, e. g., *Agrotis ypsilon* and *Pieris brassicæ*, both of which, during certain months, disappear completely from the affected regions, the adults suddenly reappearing after a long absence to deposit their eggs. Their disappearance is probably due to migration, but nothing is definitely known as to their movements. Such information is necessary in order to determine the most effective methods for their control.

In the body of the report the various crops are taken up in order, the pests enumerated in each case, and each species is then discussed in its turn. On account of the enormous field covered the specific accounts of the numerous pests are necessarily very brief; the object of the meeting having been to bring up for discussion any questions or recent observations by the members, on matters of importance in their work. It should be remembered, in this conneetion, that in India there is but one entomological staff, the work of the provinces being under the advice and direction of the Imperial Entomologist.

In order to give the reader some idea of the variety of crops and other plants grown for useful purposes in India, the following classification employed in the report may be quoted from the table of contents. The figures refer to the number of different crops listed under each heading: Hill crops, 6; leguminous field crops, 24; oil seeds, 7; Malvaceæ, 10; non-malvaceous fibre crops, 3; sugar cane, paddy (rice) and other cereals, grasses and fodder crops, 23; fruit-trees, 38; palms, 4; garden plants, 15; drugs and dyes, 5; cruciferous crops, 10; other vegetables and condiments, 31. There is also a section on stored products, 3.

The various insect pests discussed and the crops they infest are so numerous and so unfamiliar to most of our readers that it would be useless to give them more than a passing notice. A few

of the destructive species are also well known in America, such as *Heliothis obsoleta*, *Cirphis unipuncta*, *Agrotis ypsilon* and *Aphis brassicæ*, and many others belong to familiar genera, e. g., *Diacrisia obliqua*, a woolly-bear, which attacks a great many plants and sometimes occurs in very destructive numbers. Among the more important crops cotton suffers from a very long list of pests, including several species of boll-worms (*Earias fabia*, *E. insulana*, *Gelechia gossypiella*). The American boll-worm, *Heliothis obsoleta*, also occurs on cotton but is not destructive, preferring other plants, particularly certain of the leguminous field crops. Rice or "Paddy," the most important of all Indian crops, also suffers from a great variety of pests, of which the most important of all is *Schœnobius bipunctifer*, a moth whose larva does enormous damage by boring in the stalks. It is estimated that the injuries caused by this one insect in Southern India alone amount to one hundred millions of Rupees annually. *Pachydiplosis oryzæ*, a gall midge, is another very destructive enemy of rice. Two of the other pests of rice are not insects but crustaceans, a land crab. *Paratelphusa hydrodromus*, and a Phyllopod, *Apus cancriformis*. Wheat and oats are both attacked by the common Army-worm (*Cirphis unipuncta*) and other species of Cirphis, but the most important pest of wheat seems to be a termite (*Microtermes anandi*), which destroys seedlings and sometimes also plants that are coming into ear.

Of the numerous fruit-trees, mangos are among the most widely grown and the most extensively attacked by insects. No less than 57 species attack the various parts of this tree. The principal enemies of the fruits are weevils of the genus *Cryptorhynchus* and three species of fruit-flies, *Chætodacus* spp., this genus being the one to which most of the fruit-flies of the region belong. The general question of the control of fruit-flies is taken up at some length under the discussion of insects affecting the peach.

On account of the fact that agriculture in India is practised chiefly by the natives whose superstitious beliefs and utter ignorance of the life-histories of insects are deep-rooted and difficult to overcome, the methods of controlling insect pests must needs be of the simplest character. Hence we find that the use of in-

secticides is rarely possible on an effective scale, and it is necessary in most cases to resort to such simple expedients as hand-picking, destruction of affected parts, the use of bait and light traps, bag-nets, etc. Considerable experimental work is being done, however, in the use of insecticides and the introduction and dissemination of parasitic and predaceous insects is also receiving much attention.

The report is beautifully illustrated by 35 coloured plates of very fine quality, each showing the life-history of a single species of insect.

RECENT CANADIAN PUBLICATIONS.

(Continued from page 356.)

THE ORTHOPTERA ((COCKROACHES, LOCUSTS, GRASSHOPPERS, CRICKETS) OF NOVA SCOTIA; WITH DESCRIPTIONS OF THE SPECIES AND NOTES ON THEIR OCCURRENCE AND HABITS.—By Harry Piers, Curator of the Provincial Museum of N. S. From Trans. N. S. Inst. Sc.; vol. XIV, pp. 201–356, with 4 plates. Halifax, N. S., 1918.

It is gratifying to note the growing interest in systematic entomology in Nova Scotia. Through the combined efforts of Messrs. Piers and C. B. Gooderham considerable information has been gathered on the distribution and habits of the native species of Orthoptera, a group of which until recently little has been known in the Maritime Provinces.

The fauna is very sparse, only 26 species having been recorded, although two others are included as being practically certain to occur in the Province. This is somewhat surprising in view of the fact that the Transition Zone is said to be represented in the Province, and many other species range throughout this zone in eastern North America. Possibly intensive collecting in a larger number of localities will reveal a fair number of additional forms, though the author believes the total number will never exceed about 35.

In Part I, which contains general matter introductory to the study of the Orthoptera, there is also a valuable historical account of our knowledge of the Nova Scotia species, in which the author

has been able to establish the identity of the species recorded by Francis Walker (Cat. Derm. Salt. Brit. Mus., 1869–71). This part also contains an account of the life zones of Nova Scotia with the distribution of the Orthoptera within these, useful information on climatic conditions of the Province in relation to the time of hatching and other phenomena of seasonal distribution, and some interesting comparisons between the faunas of Nova Scotia and other regions in Eastern North America, more particularly New England.

Part II contains keys to the families, genera and species, with descriptions of each form and full notes on distribution, both general and local. There are also many interesting notes on habits haunts, stridulation, etc. A very full account is given of the variations in Nova Scotian specimens of the common field cricket, *Gryllus pennsylvanicus* (*G. assimilis*).

The following minor errors may be noted here:

P. 256. *Nomotettix cristatus* has been reported from Go Home Bay, Georgian Bay, Ont., in addition to the Toronto record (39th Ann. Rep. Ent. Soc. Ont., 1909, p. 113.)

P. 297. The macropterous form of *Melanoplus fasciatus*, stated to be known only from Michigan, has been reported also from Lake Simcoe (Can. Ent., XXXI, p. 32), Fort William and the Temagami District Ont. (l. c., XLI, pp. 142, 207).

P. 325. The genus Ceuthophilus is now referred to the subfamily Rhaphidophorinæ, not the Stenopelmatinæ.

P. 336. Concerning *Nemobius carolinus* it is stated that the present author "does not report it from Ontario (1904), although his common *N. angusticollis* seems to be a somewhat related form." The latter name has been placed in the synonymy of *N. carolinus* (Walker, Can. Ent., XLI, p. 211).

The paper is illustrated by four plates and several text figures, characters of all the species being shown.

Dragonflies (Odonata) of Alberta.—By F. C. Whitehouse. Published by the Alberta Natural History Society, Red Deer, March, 1918. 16 pp. 44 figs.

We welcome this first entomological contribution from the Alberta Natural History Society, and hope that many more will

be forthcoming. So little is known of the insects of Alberta that Mr. Whitehouse's work makes a valuable addition to our knowledge of the fauna of this Province.

The author has aimed to make the paper useful to the beginner and he has, therefore, avoided all but the most necessary technical terms, and has made the descriptive notes as brief and simple as possible. They are not intended to enable the student to determine all his captures with certainty, but with the help of the figures, which in most cases illustrate the male appendages, (these being usually among the most useful characters), the identification of the males, at least, of most of the species, should not be a difficult matter, especially as the Alberta fauna is not a very large one. There are 43 species actually recorded from the Province and 12 others are included as probably occurring there.

The omission of exact localities and dates of capture, though regrettable from the specialist's standpoint, is, no doubt, due to the author's object of merely providing a simple guide for the use of the beginner, this information having been already published for most of the species in Mr. Whitehouse's papers on the Odonata of the Red Deer District (Can. Ent., XLIX, pp. 96–103; L, pp. 95–100). As a substitute, a key is given to the seasonal distribution, with remarks on the range within the Province and the relative frequency of occurrence of each species. The data for the seasonal distribution is, however, in most cases insufficient and must vary considerably according to altitude and other factors. It is, in some cases, based on a single record, which has no value for such a purpose, and in other cases the records are from localities outside of Alberta, which are equally valueless. To this extent, therefore, the key is misleading.

Unfortunately, through no fault of the author, the numbering of the pages has been omitted.

We hope that this useful little guide will stimulate others to take up the study of dragonflies in this interesting region where mountain and prairie faunas meet.

(To be continued.)

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The Canadian Entomologist.

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POPULAR AND PRACTICAL ENTOMOLOGY.

Practical Results in Spraying a Commercial Orchard for the Green Apple Bug.

BY W. H. BRITTAIN, PROVINCIAL ENTOMOLOGIST FOR NOVA SCOTIA.

The cost of spraying for sucking insects is so much higher than for fungous diseases and biting insects, that even progressive fruit growers sometimes hesitate before applying the remedies recommended for insects of this type. In the case of orchard aphids, it is often difficult to advise a definite course of action—outbreaks of these insects are so dependent upon climatic conditions and the action of parasitic and predaceous enemies. In the case of severe infestations of the Green Apple Bug (*Lygus communis* var. *novascotiensis* Knight), no such hesitation need be experienced. An abundance of data has now been accumulated, which shows that even when a single year only is considered, economically profitable results can be expected, though, of course, the benefit from the work should be considered over a period of years. The tables accompanying this paper give details of the results of control operations in one orchard. Needless to say, such results can only be obtained by a thorough knowledge of the life-history and habits of the pest and by the most thorough and searching work.

The orchard for experiment was taken over in 1917 as a demonstration in the control of the Green Apple Bug. One part, comprising approximately 6 acres, consisted of very large 60 year old trees of mixed varieties; another part consisted of about four acres of 30 year old trees, mostly Golden Russets. The remainder consisted of a mixed lot of trees of varying ages, but mostly younger than the Golden Russets, comprising between two and three acres. This lot was very thickly planted and set with fillers of plums, pears, etc.

The work of the insects was first noticed in the old orchard where the infestation was still most severe. Here it was gradually rendering the trees worthless, reducing the crops of the chief

varieties to such an extent as to scarcely repay picking. The work of the insects was, for the three years in which we had it under observation, so severe that most of the blossoms would be stung to death before forming fruit. In most cases these trees would blossom heavily, but any fruit that was able to set would soon be punctured by the bug and either drop to the ground or develop into a gnarled or twisted apple. The damage to the smaller twigs was also very apparent, a great deal of the fruiting wood being severely damaged by repeated punctures and covered with scars resulting therefrom. Much of the young growth had been killed outright. The past was now becoming similarly injurious in the Golden Russet orchard and, while the damage to the twigs had not here reached such a state as in the older trees, the crop was gradually and steadily being destroyed. Finally, the bug was rapidly gaining a foothold in the remaining part of the orchard, though the infestation was far from being as severe as in the rest.

The whole orchard, with the exception of the smallest part mentioned above, which was sprayed by the owner, was treated for Green Apple Bug, nicotine sulphate (blackleaf 40), 1 pint to 100 gals. being used. In the spray immediately before the blossoms opened, this was combined with lime sulphur and arsenate of lime. In the after-blossom spray, the fungicide was sodium sulphide ("soluble sulphur") and the arsenical poison was omitted. All our attention was concentrated on spraying for the bug, and when weather conditions were such that injury from the application of the fungicide seemed likely, it was omitted from the spray. A "Friend" spray gun was used throughout the work, as this instrument proved more effective than the ordinary nozzles.

On the Golden Russet orchard and on the Gravensteins in the large orchard, the spray was applied under ideal conditions and resulted in the practical elimination of the bug. A few might still be found in the tops of the trees, but their number was insignificant and they were able to accomplish little damage. In the remainder of the old trees, trouble with the outfit resulted in considerable delays, and most of this block failed to receive the first and most important spray, so that it was only with great difficulty and by

taking the utmost pains that we were able to secure a fair measure of control.

In analyzing the results of this work we are unable to make comparison with check plots, as the owner did not desire to leave any trees untreated, and to have done so would have disturbed our

COMPARISON OF VALLEY CROP WITH THAT OF EXPERIMENTAL ORCHARD.
TABLE No. 1.

Year	Total crop for entire valley bbls.	Percentage of previous seasons' crops	Total actual crop in orchard	Percentage of previous years crops all varieties	Total theoretical crop in orchard	No. bbls. Grav.	No. bbls. Nonpareils	No. bbls. Russets
1910	323,000							
1911	1,740,000	538.7	2200			220	95	600
1912	993,338	57.1	1800	81.4	1256	206	55	400
1913	650,901	65.5	1300	72.4	1179	123	110	81
1914	650,900	100.0	780	60.	1300	159	4	75
1915	613,882	94.3	560	71.8	735	90	1	46
1916	681,470	111.0	360	64.3	621	39	3	25
1917	744,730	109.26	1465	406.9	393	246	75	330

sprayed plots to some extent, owing to the flying in of adults from the untreated plots. It was, therefore, necessary to compare the quantity and quality of apples obtained in 1917 with that obtained in previous years, and further to compare this with the general crop for the whole Valley over the same period. This is to make certain that the results obtained actually represent the effects of our work, and not of other factors which might have operated over the entire district. Last of all, we will compare the results obtained by our own work with those obtained on the portion sprayed by the owner, as far as this is possible. In doing so, it should be remembered that the conditions in that part were not ideal for good work and that the comparative inexperience of the man who did the spraying, would render effective control unlikely. On the other hand, however, the infestation in this part of the orchard was much lighter than the rest.

Table No. 1 shows that in 1911 there was a phenomenally large crop, following an abnormally low one of the previous year. The crop of 1912 was also large, but since that year the fluctuations have not been wide.

For the purpose of better emphasizing the result of our work in the orchards, the table gives not only the actual crop, but also a "theoretical crop." This is obtained by calculating the crops which the orchard would have yielded had it followed the general average for the Valley. For example, the crop for the entire Valley in 1916, was 111% of the 1915 crop. The 1915 crop in the experimental orchard was 560 barrels; therefore, the theoretical crop could be 621 barrels, though the actual crop was considerably below that figure, viz., 300 barrels. By comparing the theoretical crop, obtained in this way with the actual crop, we find that up to and including the year 1913 the crop in the orchard is better than the average, but in 1914, it dropped below and continued to do so every year until 1917. This period corresponds with the increasing severity of the infestation of the Green Apple Bug as shown by actual observation. The figures for the three leading varieties show in a very striking manner the steady falling off in yield, and no one who watched the work of the pest in the orchard could doubt that it was the cause of the decline. In 1917, the year the treatment was given, the crop for the entire Valley was 109.26% of the previous crop, while the crop in the orchard was 406.9% of the crop of the previous year. Expressed differently, the actual crop was 1,469 barrels, while the theoretical was 393 barrels.

PERCENTAGE OF DIFFERENT GRADES OF ALL VARIETIES IN ENTIRE VALLEY AND IN EXPERIMENTAL ORCHARD

TABLE No. 2.

Year	Per Cent. of Different Grades in Entire Valley.			Per cent. of Different Grades in Experimental Orchard.		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
1912	39.5	15.2	45.3	49.6	16.	34.4
1913	32.10	14.4	53.5	33.9	18.4	47.7
1914	50.1	23.3	26.6	59.3	22.4	18.3
1915	34.1	11.1	54.8	22.2	7.6	70.2
1916	40.3	18.9	40.8	49.9	18.8	31.3
1917	34.	20.8	45.2	65.3	12.4	22.3

PERCENTAGE OF DIFFERENT GRADES OF ALL VARIETIES IN EXPERIMENTAL ORCHARD, IN 1917.

TABLE No. 3.

Variety	Per Cent. of Different Grades on Portion Sprayed by Owner.			Per Cent. of Different Grades on Portion Sprayed by Department.		
	No. 1	No. 2	No. 3's & Culls	No. 1	No. 2	No. 3's & Culls
Grav	28.9	4.6	66.5	43.5	9.6	46.9
Ribston	53.8	19.4	19.4	77.3	9.	13.7
Kings	33.5	19.3	47.2	72.1	13.	14.9
Mann	53.8	17.4	28.8			
Wagner	37.	25.	38.			
Can. Orange	40.8	28.9	30.3			
Pewaukee	40.	40.	20.			
Golden Russet				20.9	49.3	29.8
Blenheim				74.3	11.	14.7
Baldwin				66.4	12.9	20.7

It should be noted here that the orchard in question has always received better than average care. Before the infestation of the bug began to make itself felt, it yielded crops considerably above the average. It has always been sprayed for apple scab and biting insects, and the quality of fruit has generally been better than the average in spite of the increasing number of gnarled and twisted fruit due to the work of the bug. The percentage of different grades obtained since 1911, is shown in Table No. 2.

Lastly, a comparison of the different grades of fruit in the orchard treated by us and by the owner, shows a decided advantage in favour of the former, as shown by Table No. 3. This was largely due to the smaller percentage of twisted fruit, as the scab control was about equal. As previously stated, the natural infestation in that part of the orchard treated by the owner was much lighter than in the remainder.

A comparison of the conditions in the experimental orchard in 1918 with those of the previous season is of interest. This year the orchard was not sprayed for the Green Apple Bug. Careful examination of the orchard shows that in the older, larger trees, there is still a considerable infestation, though not quite so severe as formerly, while in the Golden Russet orchard, where it will be remembered the best work was done in 1917, the pest could only be found by searching. The necessity of doing timely, thorough work from the standpoint of future years' infestations, is thus further emphasized.

NOTES ON CHALEPUS RUBRA WEB., IN NEW JERSEY.

BY ALAN S. NICOLAY AND HARRY B. WEISS,* NEW BRUNSWICK, N. J.

This species occurs throughout New Jersey, and according to Smith's List is common during May, June and September on locust and sometimes on basswood. Blatchley in his "Coleoptera of Indiana" states that it occurs on locust, oak, soft maple and basswood. Neither of these publications mentions the leaf mining habits of the larva. Chittenden, in his paper on "The Leaf-Mining Locust Beetle with Notes on Related Species," (Bull. 38, N. Ser., U. S. Div. Ent.) states that Harris discovered the larva in 1827 mining the foliage of white oak (Harris, Bost. Jour. Nat. Hist., vol. I, pp. 141-151, 1835) and further records it from New York during June and as late as September.

According to Beutenmuller, it mines the leaves of apple and linden, and the adult is recorded as occurring on white birch, hornbeam, cherry, Juneberry and *Pyrus arbutifolia*. Harris in his "Insects Injurious to Vegetation" lays stress on its importance as an apple pest and mentions chokecherry and shadbush as additional food plants. Chittenden (loc. cit.) states that its life-history appears to be similar to that of the locust beetle *C. dorsalis* Thunb., and records from published statements that the beetles appear during the last of May and deposit eggs on the host leaves in which the larvæ mine. The eggs are described as small, round and of a blackish colour, being fastened to the surface of the leaf either singly or in groups of four or five.

In New Jersey we have found the mines not uncommon on the leaves of various species of oaks, each one usually being at the edge of a leaf. The larva eats all of the parenchyma in its, mine resulting in the mine being visible on both leaf surfaces. It shows plainest, however, on the upper surface as a white elongate irregular discoloration. During the last half of June and first half of July the larvæ can be readily found within their mines. We have never found more than one larva in a mine. The pupal stage requires about two weeks and occurs the last week in July and first part of August, the beetles emerging during the second week of August and later. After emerging from the pupa case the beetles are light yellowish red, without distinct markings.

*The arrangement of the authors' names is alphabetical.

After remaining in the larval mines for several days the colours become darker and the markings more distinct.

Full grown larva. Length 7.5 mm. Elongate, composed of 13 segments, very little tapering posteriorly. Colour white except the head, most of the first thoracic segment, legs and upper side of anal segment, which are brownish or brownish red. Thoracic and abdominal segments convex above and less so below. Head subquadrate, flat, shining, with median dorsal line groove terminating in an inverted V. Head about ½ the greatest width of the first thoracic segment. Antennæ 3-jointed, joints of equal length. First thoracic segment 1½ times the length of the second. Second and third of equal length. Thoracic segments of equal width, sides arcuate. Sides of abdominal segments 1 to 8 produced into triangular tubercles (giving abdomen a notched appearance) capped with minute globular tubercles bearing several minute hairs. First thoracic segment bearing a faint, median dorsal impressed line with a transverse, foveiform impression on either side. Dorsal surface of 2nd and 3rd thoracic segments and abdominal segments 1 to 8 each with a transverse, median impression and a short, oblique one on either side. Ventral surface of abdominal segments 1 to 8 similar to dorsal surface except that the transverse impressions are somewhat curved. Nine pairs of stigmata, one pair on second thoracic segments, and a pair each on all abdominal segments except the 8th. Each abdominal spiracle situated at the base of the lateral tubercle a little before the middle of the segment, the ninth pair in the dorsal surface of the anal segment. Thoracic and anal stigmata larger than the others.

Pupa. Length 6.5 mm. Resembles larva in general shape but is shorter and more convex. Colour reddish brown. Abdomen showing lateral tubercles conspicuous in larva, each tubercle bearing 2 or 3 long bristles. Dorsal surface of 1st thoracic segment bearing 6 pairs of minute tubercles arranged in a triangle of three on either side of a fine median white line, each tubercle bearing a long spine-like hair. Dorsal surface of each abdominal segment bears 10 minute tubercles, (4 medially and 3 lateral ones on either side) each bearing a long spine-like hair. A pair of spine-like hairs

at the base of each antenna. Tip of mesothoracic wing-pad bearing several bristles. Distal ends of femora each bearing a pair of minute tubercles tipped with long spine like hairs. Ventral surface of each abdominal segment bearing several tubercles and spine-like hairs, those on last two segments being the most prominent. By reason of this armature and abdominal movements, the pupa can move quickly and readily.

EXPLANATION OF PLATE XI.

Figs. 1 and 3. Oak leaves showing mines of *C. rubra*.

Fig. 2. *Chalepus rubra* (after Chittenden in Bull. 38, N. Ser., U. S. Div. Ent.).

AN ENTOMOLOGIST WANTED.

The Civil Service Commissioners of Canada hereby give public notice that applications will be received from persons qualified to fill the following positions in the Civil Service of Canada:—

An Assistant Entomologist in the Entomological Branch of the Department of Agriculture in Grade "C" of the First Division at an initial salary of $2,200 per annum. Candidates must be graduates of a recognized university, and must possess a good working knowledge of the classification of the orders of insects in addition to any special knowledge they possess of particular groups. Candidates should submit a statement of their training, experience and other qualifications, also a list of the entomological papers published by them, together with copies of such papers when possible.

Applications should be sent at the earliest possible date to the Secretary of the Civil Service Commission, Ottawa, from whom application forms may be obtained. Particulars with regard to the duties of this position may be obtained from the Dominion Entomologist.

December, 1918

CHALEPUS RUBRA, ADULT AND LARVAL MINES IN OAK LEAVES.

THE LIFE-HISTORY AND EARLY STAGES OF CORYTHUCHA PARSHLEYI GIBSON.

BY HARRY B. WEISS AND EDGAR L. DICKERSON, NEW BRUNSWICK, N.J.

This species was described by E. H. Gibson in the Trans. Amer. Ent. Soc. XLIV, 69-104, April 4, 1918, from specimens collected by us on walnut at Hammonton, N.J. In the above publication, Gibson states that the food plants are walnut and juneberry (*Amelanchier intermedia*). When we first collected this species on walnut, specimens were submitted to Mr. Parshley together with specimens of *C. cydoniæ* from juneberry. When Mr. Parshley sent the specimens to Mr. Gibson for description, it is quite possible that the host labels might have been accidentally changed. However, repeated visits to the type locality, Hammonton, N.J., and numerous examinations of both walnut and juneberry have resulted in finding the species only on the former plant.

In New Jersey we have found *parshleyi* at Hammonton on butternut (*Juglans cinerea*), walnut (*Juglans nigra*) and Japanese walnut (*Juglans sibboldiana*), and at Cedarville and Bridgeton on walnut. An additional locality in New Jersey is Ramsey, by Dr. F. E. Lutz. Records of its occurrence outside of New Jersey are: Lake Waccamaw, N.C., April 20, (on pecan) (R. W. Leiby) and Great Falls, Va., Sept. 5, (on walnut) (Coll. of H. G. Barber). It undoubtedly occurs in many other localities and is possibly wrongly labeled in collections as *Corythucha juglandis* Fitch.

The following observations relative to *C. parshleyi* were made at Hammonton, which is in the southern part of New Jersey. Overwintering adults appeared about the middle of May, and during the third and fourth weeks of this month egg laying was well under way. From one to four eggs were laid in the angles formed by the mid-rib and the side ribs on the under leaf surfaces. Some eggs were found upright in the leaf close to the mid-rib and removed from the vein angles, while others were inserted in the base of the mid-rib, projecting parallel to the leaf surface. Most of them, however, were found in the vein angles in groups of two or three, each egg being more or less perpendicular to the leaf surfaces. Here they were partly hidden by pubescence, only the

black, conical tops being visible. Most of the eggs were found in the basal half of the leaf, and none at the tips where the veins were finer. The basal ends were inserted only slightly in the tissue, and each egg could be easily removed.

By the third week in June, a few second stage nymphs, many third and fourth, and a few fifth, were found. By the end of the first week in July, quite a few adults of the first brood were present together with many fifth stage nymphs. Eggs were deposited soon afterward in uninfested leaves, and during the last week in July first stage nymphs of a second brood were observed. During the last part of August and first part of September adults of a second brood appeared and later went into hibernation. Thus it is seen that there are two generations, each requiring about six weeks. On account of the extended oviposition period, it is possible at times to find all nymphal stages and adults and more or less overlapping of the broods takes place.

After hatching, the nymphs feed in colonies on the under leaf surface, causing a discoloration of the upper surface. In severe infestations, the leaves become yellow and dry, and many fall to the ground. The dorsal surfaces of all nymphs are covered with minute spines in addition to the larger tubercles and spines. As the nymphal stages advance, the insects tend to become broader and flatter; the lateral margins become flatter and more conspicuous, and the spines and hairs more pronounced.

Egg.—Length 0.51 mm. Greatest width 0.14 mm. Elongate oval, slightly curved when viewed laterally. Basal end rounded, gradually narrowing to distal end, which is covered with a conical cap, below which is a constriction. Widest at basal third. Basal one-half to one-third translucent, remainder dark brown to black.

First Nymphal Stage.—Length 0.5 mm. Greatest width exclusive of spines 0.2 mm. Broadly elliptical. General colour brown, lightest at posterior end of thorax and anterior end of abdomen. Fine median dorsal line beginning on head and extending through the second abdominal segment. A single broad, dorsal light band extending from head to posterior end of abdomen. Entire dorsal surface covered with minute spines. Eyes not

prominent consisting of a group of five ommatidia. Antennæ one-fourth to one-third the length of the body, translucent, bearing several hairs. Head with two minute tubercles on front each bearing a hair, a divided tubercle on vertex bearing two fine hairs and a pair of tubercles on dorsum each bearing a hair on tip and another one posterior. A pair of median tubercles on mesothorax each bearing a hair. A pair of median tubercles on second abdominal segment each bearing a hair. A pair of more prominent median tubercles on the 5th, 6th, 8th and 9th abdominal segments each bearing a single spine-like hair on the tip. Tubercles on the 5th, 6th and 8th abdominal segments also bear two longer spine-like hairs anterior to spine-like hair at tip. A single lateral spine-like hair arising from tuberculate base on pro- and mesothorax, and all abdominal segments beginning with the second. Ventral surface light; rostrum translucent, one-half the length of the body; legs translucent tinged with brown, tarsi tipped with pair of claws.

Second Nymphal Stage.—Length 0.75 mm. Greatest width exclusive of spines 0.4 mm. Narrowly oval to broadly elliptical, posterior end obtusely round, sides margined. Colour brown, light median dorsal line beginning on head and extending through the pro- and mesothorax broadening into a central dorsal light spot on the metathorax and the first and second abdominal segments. Dorsal armature similar to that of the first stage but more pronounced, lateral spine-like hairs becoming spines. Each lateral spine on the pro- and mesothorax has a minute spine posterior to it. Antennæ and eyes similar to those of first stage. Median portion of ventral surface light; beak translucent, one-half the length of the body. Legs similar to those of first stage.

Third Nymphal Stage.—Length 1.0 mm. Greatest width exclusive of spines 0.52 mm. Broadly oval, obtusely rounded at posterior end. Colour similar to that of preceding stage but somewhat darker. Lateral margins of 1st and 2nd abdominal segments light. Dorsal armature somewhat similar to that of proceding stage but more prominent. Lateral tubercles of pro- and mesothorax each bearing a prominent spine and four minute spines surrounding it. Lateral tubercles of abdomen more pronounced,

each bearing a hair on inner side. Legs, antennæ and rostrum white tinged with brown, otherwise similar to those of preceding stage.

Fourth Nymphal Stage.—Length 1.31 mm. Greatest width exclusive of spines 0.71 mm. Shape oval. Colour dark brown, fine V-shaped light line on median dorsal surface of head, connected with fine median dorsal line extending through the prothorax and broadening to a light spot extending to posterior margin of 2nd abdominal segment. Lateral posterior margin of prothorax and lateral margins of first three abdominal segments light. A small, light, dorsal median spot on 8th abdominal segment. Lateral tubercles and all spines light. Antennæ, legs, rostrum and median portion of ventral surface light. Lateral margins of pro- and mesothorax lobed. Lobes of mesothorax extending beyond posterior margin of first abdominal segment. Head with pair of spines on front, tubercle on vertex bearing a pair of spines with a smaller one anteriorly and posteriorly, pair of tubercles on dorsal surface bearing one prominent and five smaller spines. Prothorax bearing a pair of dorsal median spines and a smaller pair posterior to them. Mesothorax bearing pair dorsal tubercles each bearing a spine and posterior to the spine two hairs and a smaller spine. Other tubercles and spines of dorsal surface similar to but more pronounced than those of preceding stage. Prothorax with two minute and one larger spine on anterior lateral margin and one large and three smaller spines on outer angle of lobe. Tubercle on lateral margin of mesothorax bearing three spines and two hairs and anterior to tubercle are two spines on the lateral margin. Lateral margins of abdominal segments beginning with the second, each bearing a spine on tuberculate base and an inner side of each spine, a hair. Beginning with the fourth abdominal segment, there is an additional spine below each lateral spine. Antennæ one-third to one-half the length of the body. Rostrum extending to abdomen.

Fifth Nymphal Stage.—Length 1.9 mm. Greatest width exclusive of spines 1.2 mm. Broadly oval, sides flattened. Colour dark brown except following portions which are light; legs, antennæ, rostrum, majority of spines and tubercles, fine V-shaped

line on dorsal portion of head connecting with fine median line extending to posterior portion of prothorax where it connects with a subquadrate spot, lateral posterior margins of prothorax, central portion of metathorax between tubercles, posterior half of mesothoracic lobes, lateral margins of 6th, 7th and 8th abdominal segments, dorsal median spots on 6th, 7th, 8th and 9th abdominal segments, 1st, 2nd and most of 3rd abdominal segments. Ventral surface dark brown except light median band extending from front of head to 8th abdominal segment and the 1st, 2nd and outer portion of the 3rd abdominal segments which are also light. Lobes of mesothorax extending to 5th abdominal segments, sides of lobes somewhat angulated. Head with a pair of elongate spines on front, a tubercle on vertex bearing a pair of elongate spines and a short one anterior and posterior to this pair, a pair of elongate tubercles on dorsum of head, each bearing six elongate spines of varying lengths. Prothorax with sides broadly lobed, four spines in centre arising from a tuberculate base and a pair of smaller spines arising from a posterior light area, anterior margins of prothoracic lobes bearing three short spines, posterior to these arises a long one, posterior to this long one, there is another of similar length, on lateral posterior angle of lobe is a tubercle bearing five spines of varying length and a short hair interiorly. Mesothorax with a pair of dorsal tubercles on either side of light area each bearing three spines, lateral margin bearing two spines on outer angle of lobe and two minute ones posterior to these; posterior to the two minute ones there is a tubercle bearing three or four spines. Second abdominal segment bears a pair of median dorsal spines. Fifth, 6th, 8th and 9th abdominal segments each bear a pair of median, dorsal tubercles from each of which arises a single spine with two hairs anterior to it. Lateral margins of abdominal segments four to eight bear a single tuberculate spine from base of which arises two smaller spines and a hair. Eyes prominent, consisting of a number of ommatidia. Antennæ four-jointed, sides parallel, apical joint slightly clavate, second joint two-thirds the length of the first, third joint three times the combined lengths of the first and second, fourth joint slightly longer than the first and second combined. Two apical joints bearing several long

hairs. Legs somewhat hairy, tarsi bearing two strongly curved claws. Rostrum extending to metathoracic segment.

Adult.—Length 4 mm., width 2.3 mm. This was described by Gibson as mentioned in the first part of this account. Gibson states in discussing *C. juglandis*, which is also found on walnut, that both *juglandis* and *parshleyi* occur in the type series of *juglandis* in the Fitch collection, and that this probably accounts for the more or less vague conception of *juglandis* Fitch. He states that *juglandis* is somewhat smaller than *parshleyi* and has the apical band straight across the elytra, while in *parshleyi*, the apical band runs obliquely from the costal margin toward the inner margin of elytra and is narrower. Gibson also states that *juglandis* Fitch occurs throughout New England and south and west to Kansas and Texas, its food plants including walnut, butternut and linden. This means that it undoubtedly occurs in New Jersey, but up to the present we have not been successful in locating any species other than *parshleyi* on walnut.

THE VARIETIES OF THE DRAGONFLY, *AGRION ÆQUABILE* (SAY).

BY CLARENCE HAMILTON KENNEDY, CORNELL UNIVERSITY, ITHACA, N.Y.

This living jewel with its metallic green body and crystal wings tipped with jet, flutters before the collector through the shadows of wooded streams from Maine to California, while its awkward nymph may be found crawling through the dense mats of willow and alder roots that hang in the woodland pools. Because of this timid and weak flight of *æquabile* as well as the rather special environment preferred by the nymphs, this species is seldom continuously spread in any region but is met on those occasional streams, which furnish its special requirements in patchy light, and root masses hanging in fairly clear water. As a result of this low ability to spread and the distance between broods because of the special environment required, this species has developed several marked varieties.*

By reference to the plate the reader can see at once the dif-

*This same tendency to the development of varieties in the weak-flying Agrionine dragonflies is discussed by MacLachlan, "Notes on Odonata collected by Buckley in Ecuador," Trans. Ent. Soc. Lond., 1881, p. 25

ference between these varieties, as all the figures are from the types except those for var. *æquabile*, which are from material in the Cornell collection and those of var. *yakima*, which are drawn from material collected by the writer in the type locality. All of these varieties undoubtedly intergrade because intergradations were found between var. *yakima* and var. *californicum*, and in a letter to Mr. Williamson, Dr. E. M. Walker states that such intergradations exist between var. *æquabile* and var. *hudsonicum*. The figures show that the five varieties can be grouped into two groups by the extent of colour on the male fore wing. Varieties *æquabile*, *coloradicum* and *hudsonicum* have the black of the front wing covering half the distance or less from the nodus to the tip. These are species of the eastern United States. Varieties *yakima* and *californicum* have the black of the front wings extending over more than half the space between the wing tip and the nodus. These are Pacific Coast forms.

Because of the plate, keys are unnecessary, and further notes are given under each variety heading.

Agrion æquabile æquabile (Say).

Jour. Acad. Phila., 8, p. 33, 1839. (Calopteryx).

♂ and ♀ types in the Mus. Bost. Soc. Nat. Hist.

The writer has not seen these types so the authority for their location is Muttkowski's Catalogue. This is the widely distributed eastern form that ranges across the northern states from Maine to Iowa. Probably it will be found even farther west in the Missouri River Valley. It has the least colour in its wings of any of the varieties excepting possibly *coloradicum*. It is found in all collections.

Agrion æquabile coloradicum Cockerell.

Psyche, 20, p. 173, 1913.

♂ type in the U. S. Nat. Mus.

The figures are drawn from the type. The female is unknown. This variety is from the high mountains of Colorado and differs from *æquabile* in having slightly more colour in the wings. It is the least distinct of the series of varieties. In the U. S. Nat. Mus. collection is a specimen from Ft. Collins, Colorado, identified by Dr. Banks as *hudsonicum*. I am inclined to call this *coloradicum*,

though it has more colour in the front wing than the type Probably a good series would show that *coloradicum* and *hudsonicum* intergrade.

Agrion æquabile hudsonicum (Hagen).

Proc. Boston Soc. Nat. Hist., 18, p. 22, 1875.

♂ and ♀ types in the Mus. Comp. Zool., Cambridge, Mass.

The types plus the thorax and wings of a third specimen are all from Michipicoten, Lake Superior. These are the only specimens of this variety that the writer has found in United States collections. I think this has been taken recently by Dr. Walker. It is characterized by the combination of little colour in the front wing and much colour in the hind wing. As was stated at the beginning of the article, this is said by Dr. Walker to intergrade with var. *æquabile*.

Agrion æquabile yakima (Hagen).

Psyche, 5, p. 248, 1890.

♂ and ♀ types in the Mus. Comp. Zool., Cambridge, Mass.

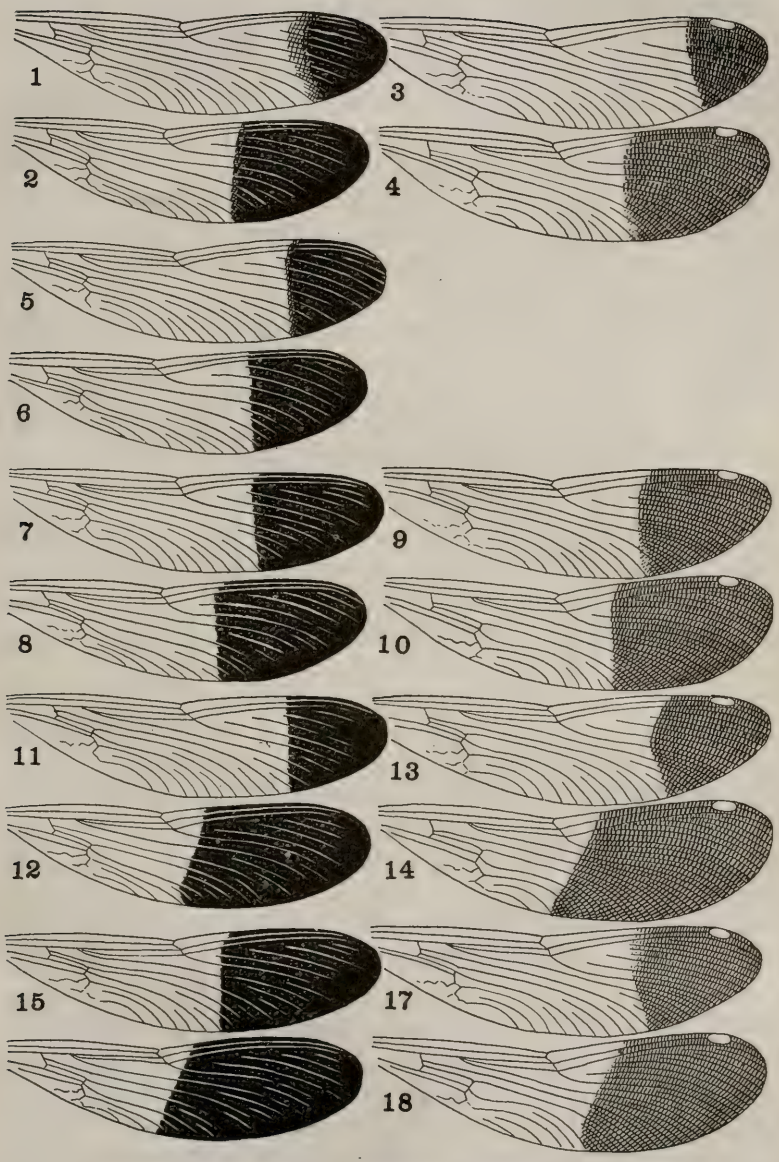
Dr. Banks kindly re-examined the types of this species for the writer and states that in the male the black in the front wing reaches barely more than half the distance from the tip to the nodus, and in the hind wing about two-thirds of the distance. While the types are from the Yakima River, (Wash.), this is the variety distributed through the Columbia River Valley. It has been recorded from Montana, (Elrod; Sci. Bull. Univ. Mont., p. 150-151, 1902), but the writer has seen none of the Montana specimens. A single male specimen is in the Cornell collection from Corvallis, Oregon. This is on the Willamette River, west of the main range of the Cascade Mountains, and, therefore, outside of the main Columbia River Valley, though the Willamette is a tributary of the Columbia. This variety intergrades with the next as is discussed in the succeeding section.

Agrion æquabile californicum Kennedy.

Proc. U. S. Nat. Mus., 52, p. 483-484, 1917.

♂ and ♀ types in the U. S. Nat. Mus., Washington, D. C.

This form has the most colour on its wings of any of the varieties of *æquabile*. The hind wing is as extensively coloured as in *hudsonicum*, and the front wing has the colour extending more than half way from the tip to the nodus. It is known from the



VARIETIES OF AGRION ÆQUABILE SAY.

types from the collection of Mr. and Mrs. Reynolds. The specimens were caught by Mr. Nunenmacher at Blue Lake, Humboldt Co., California. Other slightly less typical specimens are in Dr. Calvert's collection from Seattle, Washington. This variety is probably a member of the fauna of the narrow, very humid coast strip extending from northern California to southern Alaska. Various other species have dark forms in this humid belt. In the collection of the U. S. Biological Survey in Washington, D. C., are a male and a female *Agrion æquabile* collected on the Owyhee River, at Rome, Malheur Co., Oregon, which are intermediate between var. *yakima* and var. *californicum*. These are from southeastern Oregon. The writer had thought at first that the var. *californicum* might be a Pacific Coast extension of var. *hudsonicum*, but since the Malheur Co., Oregon, specimens have come to light it seems more closely related to var. *yakima*.

EXPLANATION OF PLATE XII.

Figs. 1–4. *Agrion æquabile æquabile*, specimens in the Cornell collection from Orono, Maine. 1–2 male, 3–4 female.

Figs. 5–6. *Agrion æquabile coloradicum*, male type in the U. S. National Museum. Female unknown.

Figs. 7–10. *Agrion æquabile yakima*, specimens in the writer's collection from Satus Creek, Yakima Co., Washington. 7–8 male, 9–10 female.

Figs. 11–14. *Agrion æquabile hudsonicum*, types in the Museum of Comparative Zoology, Cambridge, Mass., from Michipicoten, Lake Superior. 11–12 male, 13–14 female.

Figs. 15–18. *Agrion æquabile californicum*, types in the U. S. National Museum from Humboldt Co., California. 15–16 male, 17–18 female.

NOTE ON AGRION ÆQUABILE HUDSONICUM (HAGEN).

Mr. Kennedy has asked me to add any remarks to his paper on *Agrion æquabile* that I might think desirable. I have only the following note to make concerning the race *hudsonicum*.

I have four much broken males of *A. æquabile* from the Kenogami River, Ont., on the Hudson Bay slope, north of Lake Superior, taken by Mr. W. J. Wilson in 1904. They were all taken within

3 miles of the mouth of the Flint River. Two of them are dated July 9, another July 8, the fourth, August 8. This last specimen is peculiar in having only the front wings darkened apically, though quite mature. The others are all of the race *hudsonicum*, although one of them approaches the race *æquabile* slightly in having a little less black on the hind wings.

I have also a series from several parts of Algonquin Park, Ont., which is on the edge of the Canadian Zone. Some of these specimens are typical *hudsonicum*, and on the whole they are quite similar to the Kenogami River specimens. Another series, taken at Kitchener, Ont., (formerly Berlin), by W. J. Fraser have, on an average, slightly less black on the apices of the wings than the Algonquin Park specimens. Some of these are typical *æquabile* except that the black area of the front wings is perhaps a little smaller, while others are nearer *hudsonicum* and cannot be distinguished from Algonquin Park specimens.

Hudsonicum tends to be a larger, stouter race than *æquabile*.

E. M. Walker.

NEW NEARCTIC CRANE-FLIES (TIPULIDÆ, DIPTERA). PART VI.

BY CHARLES P. ALEXANDER, LAWRENCE, KANS.

(Continued from Page 386.)

Tipula kansensis, new species.

Coloration pale brownish yellow; the mesonotal præscutum with five narrow, dark brown lines; antennal flagellum dark brown; wings with a white and brown picture on a pale brownish gray ground; male hypopygium with the ninth tergite small, deeply impressed medially to form two tumid halves; ninth pleurite produced into a flattened, chitinized lobe that is truncated apically; two pendulous, fleshy lobes in the notch of the ninth sternite.

Male.—Length 17 mm.; wing 15.3 mm.

Frontal prolongation of the head long, grayish brown; nasus indistinct; palpi with the three basal segments brownish yellow, the terminal segment dark brown. Antennæ rather short, the first three segments brownish yellow, the flagellum dark brown; the basal enlargements of the segments a little darker. Head grayish brown, with a distinct impressed median line.

Mesonotal præscutum brownish yellow, the usual stripes

represented only by dark brown margins, there being five such narrow lines, of which the lateral ones are broadest; remainder of the mesonotum grayish yellow, with numerous black setigerous punctures. Pleura yellow, sparsely gray pruinose. Halteres short, yellow, the knob, except at the tip, dark brown. Legs with the coxæ and trochanters yellow; femora dull yellow, the tips indistinctly brown; tibiæ brownish yellow; tarsi similar, the terminal segments darker. Wings mottled with brownish gray and whitish; costal cell yellow; subcostal cell similar but even more intense; stigma yellowish brown; membrane brownish gray, with darker spots at the origin of the sector and along the cord; large whitish areas along the cord extending from *R* through cell Cu^1 to the wing margin; a pale area beyond the stigma in cell *2nd* R^1 and the base of R^2; cell M^1 largely pale; two large, pale areas in the first anal cell. Venation: R^2 long, a little longer than the petiole of cell M^1; cell *1st* M^2 small, the punctiform *m-cu* inserted at about one-third to one-fourth its length.

Abdominal tergites brownish yellow, becoming darker near the hypopygium; an indistinct, interrupted, brown sublateral stripe; basal segments broadly ringed with silvery; sternites brownish yellow. Male hypopygium rather large. Ninth tergite small, deeply impressed dorso-medially to form two tumid halves; caudal margin flattened, with a deep, V-shaped median notch, the adjacent lobes subacute, reddish, each with a small, U-shaped lateral notch. Ninth pleurite incomplete, the pleural suture deep, the dorsal posterior margin of the pleurite produced dorsad into a flattened, chitinized margin that is truncated apically; outer pleural appendage small, slender, cylindrical. Dorsal inner angle of the ninth sternite with two pendulous, fleshy lobes hanging in the notch of the sternite, these tumid and clothed with abundant long, pale hairs; eighth sternite large, the caudal margin almost straight medially, with a broad fringe of long yellow hairs; the lateral lobes produced.

Habitat.—Kansas.

Holotype.—♂, Lawrence, Douglas County, Kansas, June 4, 1918.

Tipula alaska, new species.

Antennæ with the flagellum uniformly pale brown; meso-

notum dull yellow, the præscutum with three brown stripes; wings subhyaline or with a very indistinct pattern; abdomen yellow, trivittate with reddish brown; male hypopygium with the ninth tergite large, flattened, narrowed posteriorly and with a very deep median notch.

Male.—Length 17 mm.; wing 17.7 mm.

Female.—Length 20 mm.; wing 17.5 mm.

Frontal prolongation of the head moderately elongated, dull brownish yellow, the nasus very small. Antennæ of the male moderately elongated, the scape yellow, the flagellar segments uniformly pale brown; basal swelling of the flagellar segments not conspicuous. Head brownish yellow.

Thoracic dorsum dull yellow, the mesonotal præscutum with three dark brown stripes, the median one a little paler and bisected behind, the lateral stripes continued backward on to the scutal lobes; scutellum dark brown, more yellowish laterally; postnotum dull yellow medially, brown on the sides; a delicate capillary brown line extends from the præscutum backward to the base of the abdomen. Pleura dull yellow, the mesosternum and the mesepisternites brown. Halteres pale, the knobs, except the tips, paler. Legs with the coxæ dull yellow, the cephalic face of each more brownish; trochanters dull yellow; femora yellow, the tips broadly dark brown; tibiæ and tarsi similar, the tips of the individual segments narrowly darker. Wings grayish, the stigma more yellowish brown outwardly; a broad obliterative streak along the cord continued into the base of cell M^4. Venation: basal deflection of R^{4+5} short or punctiform; basal deflection of Cu^1 from one-third to one-fourth the length of cell *1st* M^2.

Abdomen dull yellow, the segments narrowly ringed caudally with silvery; tergites beyond the base with a narrow, indistinct, reddish-brown stripe that is interrupted at the posterior margins of the segments; lateral margins of the segments with a conspicuous triangular reddish-brown blotch; basal sternites yellowish, terminal sternites darker coloured. Male hypopygium moderately enlarged. Ninth tergite large, flattened, narrowed posteriorly, with a very deep median notch, the lobes formed being elongate, flattened, a little divergent, the tips subacute; the tergite is dark brown on each side of the base, the apex yellowish. Ninth pleurite

incomplete, the suture well indicated beneath, the posterior margin of the pleurite produced caudad into a slender point; ventrad of the pleurite is a large, greenish, fleshy lobe; outer pleural appendage pale, rather small, club-shaped, the base constricted, the outer face with long, scattered hairs. What appears to be the gonapophyses of the penis-guard project caudad as two acute chitinized points. Eighth sternite rather large, the caudal margin pale, the median area flattened, transverse, finely fringed with reddish hairs, the lateral angles produced caudad and provided with a few strong, decussate bristles and a few smaller hairs. Female ovipositor with all the valves slender, subequal in length, the tips of the dorsal valves bluntly rounded.

Habitat.—Alaska.

Holotype.—♂, head of the Tsirku R., Alaska, July–August, 1910.

Allotype.—♀, with the type.

Tipula flavibasis, new species.

Size small (wing under 14 mm.); antennæ of the male elongated, bicolorous, the basal enlargement of each segment yellow, the remainder black; mesonotum yellowish brown without distinct stripes; wings with a strong gray tinge.

Male.—Length 11.5–12 mm.; wing 12.2–12.7 mm.; antennæ about 4.5–5 mm.

Female.—Length 16 mm.; wing 12.3–13.3 mm.

Frontal prolongation of the head yellowish brown; nasus not distinct. Palpi with the basal segments brown, pale at the joints, the terminal segments more yellowish. Antennæ of the male elongated, the scape dull yellow, the first flagellar segment pale yellowish brown on the basal half, dark brownish black on the apical half; remaining flagellar segments with the basal swelling yellow, the pedicel black. Head gray, the occiput more yellowish the inner margin of the eyes narrowly pale gray.

Mesonotum yellowish brown, the usual stripes poorly indicated Pleura yellow with a very sparse white bloom. Halteres pale, the knobs brown. Legs with the coxæ and trochanters light yellow, femora yellow, the tips narrowly dark brown; tibiæ similar, the tips indistinctly darker; tarsi brownish yellow, the apices of the segments slightly darkened. Wings with a strong gray tinge, the

costal and subcostal cells yellow; stigma dark brown; a brown mark at the arculus; veins dark brown; obliterative streak broad, extending into the base of cell M^4.

Abdomen with the tergites yellowish; a broad, dark brown median stripe that is interrupted at the posterior margins of the segments; a narrower sublateral stripe; sternites yellow. Male hypopygium moderately enlarged. Ninth tergite large, the caudal margin shiny with a very deep notch at the base of which is a small, acute median tooth; lateral angles prominent, flattened, subacute and slightly divergent at their apices. Ninth pleurite complete or practically so; outer pleural appendage small, cylindrical, covered with long, coarse hairs; inner pleural appendage complex, produced posteriorly into a pale, flattened, truncated lobe that is covered with abundant pale hairs, the anterior arm heavily chitinized, the tip bifid and jutting into the notch of the tergite. Ninth sternite with two pendulous lobes hanging in the notch, these lobes narrowed toward their outer ends. Eighth sternite with the posterior margin concave, the median portion with a dense, transverse fringe of long, yellow hairs, near each lateral angle with about two powerful decussate bristles. Penis-guard very elongate, the tip split into two hair-like points.

The female is similar to the male; antennæ short; abdomen with the dorso-median stripe lacking, the posterior margins of the segments broadly ringed with pale; ovipositor with the valves acute, compressed, the tergal valves longest, blackened at their tips.

Habitat.—Kansas.

Holotype. ♂, Lawrence, Douglas Co., Kans., July 1, 1918.

Allotype.— ♀, with the type.

Paratopotypes.—75 ♂'s ♀'s, June 28–July 3, 1918.

In the peculiar antennæ, this interesting species agrees with *T. tephrocephala* Lw., but in all other respects is a very different fly.

Tipula flavo-umbrosa, new species.

Male.—Length 22 mm.; wing 21.5–22 mm.

Female.—Length 21–22 mm.; wing 18 mm.

Very similar to *Tipula umbrosa* Lw. (*inermis* Doane) but larger than that species and much more yellow throughout. The

antennæ are more clearly bicolorous apically. Præscutal stripes orange instead of dark brown, the median pair narrow, widely divided by the ground-colour. Wings strongly tinged with yellow before the cord, the costal cells yellow instead of brown. Abdomen more yellowish, especially laterally. Male hypopygium with the median area of the eighth sternite with two broadly triangular teeth, the notch between them V-shaped or narrowly U-shaped. The female is similar to the male but somewhat smaller.

Habitat.—Central United States.

Holotype.—♂, Lawrence, Douglas Co., Kansas, June 6, 1918.

Allotype.—♀, with the type (M. M. Alexander).

Paratopotypes.—Several ♂ ♀.

I have examined the type of *umbrosa* at Cambridge, and have seen paratypes of *inermis*, and they both refer to the smaller dark-coloured species of this group. It is possible that still other species remain to be separated from this complex.

SOME NEW OR SCARCE COLEOPTERA FROM WESTERN AND SOUTHERN FLORIDA.

BY W. S. BLATCHLEY, INDIANAPOLIS, INDIANA.

Between December 1, 1917, and April 1, 1918, the writer was in Florida and collected Coleoptera and Orthoptera for much of the time. The most of the collecting was done about Dunedin,* a town in Pinellas County on the west coast, but in late February and early March a trip was taken to the Lake Okeechobee region, during which several days' collecting was done at each of the following places: Lakeland, Ft. Myers, LaBelle, Moore Haven** and Okeechobee City. One day was also spent on the east shore of Lake Okeechobee at the point where the Palm Beach Canal leaves the lake. The species of Coleoptera herein noted, on account of their apparent scarcity in the State, or which are regarded as undescribed forms, were for the most part taken during the winter at some one or more of the places above mentioned.

*See Canadian Entomologist, 1917, 137.

**This is a new town on the west side of Lake Okeechobee, at the point where the Caloosahatchie River formerly emerged from the lake. A large area of the old lake area southeast of the town has been drained and is now under cultivation.

Loxandrus brunneus, sp. nov.—Elongate-oval. Above nearly uniform dark reddish brown, strongly shining; head and last ventral segment often piceous brown. Under surface pale chestnut brown; legs, mouth-parts and three basal joints of antennæ brownish yellow, outer pubescent joints of antennæ darker. Head longer than broad, eyes prominent. Thorax slightly wider than long, sides broadly and evenly curved from base to apex; front and hind angles slightly obtusely angulate; disk smooth, its sides in front of middle declivent; median and apical impressed lines fine, entire; basal impressions linear, deep. Elytra iridescent, two and one-fourth times as long as thorax, one-fifth wider at base; sides subparallel from behind humeri to apical third, then rounded and converging to apex; striæ rather deep, their inner margin very finely crenate-punctate; intervals smooth, feebly convex, the third with the usual dorsal puncture of the genus. Length 6.3—6.8 mm.

This species differs from all others of its approximate size except *crenatus* in its usually uniform shining brown colour. This is not due to immaturity, as numerous specimens, all of the same hue, have been taken. It was frequent beneath the wash-up on the shore of Lake Okeechobee, four miles southeast of Moore Haven, March 1–3, and when uncovered ran very swiftly to the nearest shelter. It was also taken at LaBelle and has been in the writer's collection undetermined since 1911, when specimens were secured about the margins of ponds and bay-heads at Sarasota. Specimens sent to the late Frederick Blanchard were returned as unknown to him, and H. P. Loding, of Mobile, Alabama, who has a large collection of southern forms of the genus, says he has nothing like it.

Loxandrus saphyrinus Chaud.—Leng, in his "Carabidæ of Florida,"* seems to doubt both the validity of this species and its occurrence in Florida. A specimen taken at Sanford, March 28, runs only to *saphyrinus* by Le Conte's tables, and is very distinct from *reflexus* Lec. of which Leng considers it a synonym, being slightly larger, with thorax less transverse, its sides more rounded, elytral striæ more coarsely punctate and surface with iridescence much stronger, being more brilliant than in any species of the genus known to me. Chaudoir's type of *saphyrinus* was from

*Bull. Am. Mus., Nat. Hist., XXXIV, 1915, 579.

Louisiana, and there is, therefore, no reason why it should not occur in Florida.

Loxandrus flavilimbus, sp. nov.—Elongate-oval. Above dark reddish or chestnut brown, strongly shining, the side margins and hind angles of thorax, and the basal three-fourths of side margins of elytra dull red; mouth-parts, legs and under surface pale reddish brown; apical two-thirds of antennæ fuscous. Head as broad as long; eyes large, feebly convex. Thorax subquadrate, disk smooth, sides broadly but evidently curved, front angles obtuse, hind ones broadly rounded into base; median line very faint, basal impressions shallow, shorter than usual. Elytra as wide at base as thorax, slightly more than twice as long; humeri feebly curved, sides behind them almost straight for three-fourths their length, then rounded and sinuate to apex; striæ shallow, their punctures rather coarse, close-set, faint or subobsolete on apical third; intervals smooth, very feebly convex. Length 10 mm.

Beneath board near border of pond north of Dunedin; Jan. 1, rare. Loding (Ms.) says he has an unnamed specimen which he considers identical. The size, pale legs, pale margin of thorax and elytra and coarsely punctured striæ preclude it from being any of the species treated in LeConte's tables. Two or three other species or forms of *Loxandrus* are at hand which cannot be placed by his tables. The genus, as represented in Florida, is one of the largest of the Carabidæ, but is badly in need of revision.

Lebia abdominalis Chaud.—This is recorded only from Enterprise and the Biscayne Bay region. A half dozen were found beneath the debris on the shore of Lake Okeechobee, near Moore Haven, and one was beaten from oak at Lakeland.

Lebia furcata Lec.—A single specimen, the first I have taken in Florida, was beaten Dec. 17 from the dead leaves of a cabbage palmetto near Dunedin. It is listed as rare at Tampa, Crescent City and Gainesville.

Plochionus amandus Newm.—A male, typically coloured, as described by Horn,* was beaten from a mass of Spanish moss on the margin of Skinner's Hammock, north of Dunedin, Feb. 11. From the descriptions I judge that *amandus* is only a colour form

*Trans. Am. Ent. Soc., X, 1882, 146.

of *discoideus* Schaupp.† Horn (loc. cit.) records one specimen from Florida.

Onota floridana Horn.—One specimen was beaten from oak at La Belle on Feb. 26. It is a scarce Floridian species, hitherto recorded from Lake Poinsett, Haw Creek, Enterprise and Biscayne Bay.

Selenophorus chokoloskei Leng.—I find two specimens of this new form among my series of *S. palliatus*. They are labeled Dunedin, March 25, 1915. It was described from Chokoloskee and Everglade.

Selenophorus depressulus Casey.—This is undoubtedly distinct from *S. iripennis* Say, and seems to be more common in southern Florida than the latter, the specimens at hand being from Sanford, Lake Istokpoga, Ft. Myers and Dunedin, the dates ranging between Dec. 30 and March 26. It occurs beneath cover, usually in rather dry spots, about the borders of gardens and cultivated fields. From *iripennis* it may be easily separated by its wider thorax which is less narrowed basally, its hind angles broadly rounded instead of obtuse and basal depressions more finely and densely punctate. Both species have the dorsal series of punctures, characteristic of the genus, very small and they are, therefore, apt to be confused with species of *Stenolophus*.

Stenolophus carbonarius Dej.—A single specimen was taken from beneath the beach debris southeast of Moore Haven on March 1. It differs from Indiana examples only in having the sutural striæ one-third shorter. Not before recorded from Florida, though LeConte* gives the range as "Middle and Southern States."

Olla oculata sobrina Casey.—This form was described from Florida without definite locality. Schwarz (Ms.)** has noted it from Jacksonville. Specimens at hand are from that place, Gainesville, Sanford, Dunedin and Ft. Myers, all taken between Feb. 24 and April 24. About Dunedin it apparently hibernates

†Bull. Brk. Ent. Soc., II, 1886, 86.

*Bull. Brook. Ent. Soc., VI, 1883, 14.

**The Schwarz (Ms.), referred to frequently in this paper, is an annotated copy of his "Coleoptera of Florida," in which all additional species of Florida Coleoptera taken by himself and others, up to within the last few years, are carefully recorded, with localities, dates, etc. Through the kindness of Mr. Schwarz I was able to borrow this annotated list from the Smithsonian Library and made a copy of all the manuscript additions and records.

in bunches of Spanish moss, but has been taken also from oak and plum trees.

Psyllobora parvinotata Casey.—Several specimens taken by beating on Hog Island. A submaritime species known from Haulover, Palm Beach and Key West. Distinguished by its lack of antescutellar spot of pronotum and small, isolated, drab spots of elytra, the general colour also paler than in *20-maculata*. Leng regards it as only a variety.

Psyllobora pallidicola Blatch.—This small Coccinellid was described* as a variety of *P. 20-maculata*, but further study of its habits and characters led me to believe it a valid species. It is always smaller, non-alutaceous and wholly without spots on thorax. As. P. N. Timberlake, Entomologist of the Hawaiian Sugar Planters' Experiment Station at Honolulu, was studying the male genitalia of Coccinellidæ, I sent him specimens of *pallidicola* for examination. Under date of Dec. 7, 1917, he wrote: "At your request I have compared the male genitalia of your *Psyllobora pallidicola* with *20-maculata* and have found considerable differences, the principal one of which resides in the length of the ædeagus. In *pallidicola* the ædeagus is very short compared with *20-maculata*, in which species it is drawn out like a whiplash. *P. tædata* Lec. and *borealis* Casey, are similar if not identical with *20-maculata* in this respect, and I doubt whether they are anything more than geographical variants. *P. pallidicola*, however, is undoubtedly distinct."

About Dunedin *P. pallidicola* occurs frequently throughout the winter on oak and wax myrtle, but is never taken with *20-maculata* which is there a scarce species. The former has also been taken at Lakeland, Ft. Myers and La Belle, and is probably widely distributed throughout central and southern Florida, and north at least as far as Ormond.

Hyperaspis nigrosuturalis, sp. nov.—Broadly oval or subhemispherical, convex. Black, shining; front of head, apical angles and side margins of thorax to behind middle, yellow. Elytra red, their basal sixth, a very narrow margin and wider sutural stripe, black; the sides of the red disk connected just behind the scutellum, the sutural stripe being incomplete. Sides of ventral

*Can. Ent., 1914, 66.

segments tinged with reddish. Tarsi brownish fuscous. Upper surface distinctly and rather coarsely punctuate, the punctures separated by more than their own diameters; under surface more coarsely and shallowly punctate. Length 3 mm.

One specimen beaten from bunch of Spanish moss near the margin of a lake north of Lakeland, Feb. 22. Differs in colour from any described form. Closely related to *H. tædata* Lec. and *regalis* Casey.

Scymnus bigemmeus Horn.—Taken on Hog Island Jan. 20 and Feb. 9 by beating vegetation just back of the skirting fringe of mangrove, *Rhizophora mangle* L. Described in 1895 from Punta Gorda and Biscayne Bay, and since recorded only from Miami.

* * * * * * * * * * * * * * * * * * * *

Near the top of page 445 of Schwarz's "Coleoptera of Florida"* is the following: "*Anamorphus pusillus* Zimm. ms. E. rare with the preceding." The preceding referred to is *Rhymbus ulkei* Cr., which Schwarz mentions as " E. (Enterprise) rare, lives on fungus which grows on dead branches." At the bottom of the page is a foot-note by Le Conte as follows: "I have not described this genus (*Anamorphus*), as its affinities are not yet clearly made out. It is a small, rounded, testaceous, hairy insect having somewhat the aspect of *Rhymbus* but without prothoracic lines; the tarsi are not dilated. The specimens at my disposal are not sufficient for a thorough investigation." It will be noted that he does not refer to the specific name *pusillus*, but only to the genus *Anamorphus*.

In 1883** Le Conte & Horn diagnosed, and, therefore, first validated, the genus *Anamorphus* as follows: "Body hemispherical; tarsi narrow, 4-jointed; prothorax with large, finely margined, basal lobe, and a basal line each side, running forwards and then curving inwards; antennæ 9-jointed, club elongate, very loose."

Henshaw in his Check List (1885, p. 49) mentions *Anamorphus* Lec., but accredits no species whatever to it. In 1906 Dury † recorded *Anamorphus pusillus* Zimm. as occurring near Cincinnati,

*Proc. Amer. Phil. Soc., XVII, 1878.
**Classification Col. N. Amer., 120.
†Journ. Cinc. Soc. Nat. Hist., XX, 251.

O., and in 1910** the writer in a key gave a brief diagnosis of the genus, based on that of Le Conte and Horn, and added: "*Anamorphus pusillus* Zimm, pale reddish brown, length 1.5 mm., has been taken by Dury near Cincinnati."

The above constitute all references which can be found in the literature available to either the genus *Anamorphus* or the species *pusillus*. Whether *pusillus* was sufficiently characterized, when it was assigned to a genus not then defined, and therefore invalid, and the species itself described only as a "small, rounded testaceous hairy insect, etc.," as set forth above, I leave for better nomenclatorial cranks than myself to settle.

A careful comparison shows that the specimen in the Dury collection differs sufficiently from two at hand from Florida to justify a new name, and as *pusillus* is known only from the description quoted, I give the principal characters of each as follows:

Anamorphus pusillus Lec.—Rounded-oval or semi-hemispherical, strongly convex. Dark reddish or chestnut brown, shining, rather thickly clothed with long, semi-erect, yellow hairs; legs and antennæ dull yellow. Eyes small, coarsely facetted, widely separated. Thorax twice as wide as long at middle, sides feebly curved, hind angles rectangular, disk minutely and sparsely punctate, each puncture bearing a very slender, yellow hair; basal lobe prominent, triangular, its apex rounded, the curved basal lines very fine. Elytra one-fifth wider than thorax, their common base widely and rather deeply emarginate to receive the basal thoracic lobe; umbones prominent; sides strongly declivent; disk with numerous scattered punctures, much coarser and more distinct than those of thorax, each bearing a longer, coarser, more erect yellow hair. Under surface smooth, polished. Length 1.2 mm.

Dunedin, Fla., March 27, 1916; March 23, 1918. Both were taken while beating in Skinner's Hammock, one mile northeast of Dunedin. One of the two has the head and apical third of elytra darker than the general hue. It is probably frequent in wet hammocks throughout the greater portion of Florida, but over-

**Coleoptera of Ind., 535.

looked on account of the small size. Schwarz (Ms.) lists it also from Crescent City, Fla.

Anamorphus waltoni, sp. nov.—Larger and broader than *pusillus*, the shape hemispherical rather than oval. Colour uniform pale reddish brown. Elytral punctures much finer and more dense than in *pusillus*, the pubescence therefore thicker and more evident. Characters otherwise much the same as those of *pusillus*. Length 1.6 mm.

Named in honour of L. B. Walton of Gambier, Ohio, the recognized American authority on the Endomychidae.

Dury's record, cited above, is as follows: "One specimen July 7, taken feeding on beech log in company with *Rhymbus minor*, which species it resembles in an astonishing manner."

Nausibius repandus Lec.—Listed by Schwarz as very rare under oak bark at Tampa. A single specimen was taken at Dunedin while sweeping huckleberry and other low shrubs on Jan. 29. It is a southern form, described from the District of Columbia, and appears to be everywhere very scarce.

Ino reclusa Lec.—A single specimen was beaten March 26 from the dead limbs of the Florida button-bush, a shrub resembling the black mangrove and growing just back of the borders of the latter near the middle of Hog Island. The beetle was described from Columbus, Texas, and has not before been recorded from Florida. It is one of the smallest (2 mm.) of Cucujids, pale brown with broad head, thorax triangular, wide in front, very narrow at base, and elytra covering only half of the abdomen.

Catogenus rufus Fab.—This widely distributed species has been recorded from several stations in Florida, though only six examples have been taken by me during seven winters' collecting. It is mentioned here only to make known its power of resisting cyanide fumes. On December 15 three were found beneath the bark of a pine log and placed with other specimens in a heavily charged cyanide bottle. Five hours later they were all alive and active, though everything else in the bottle had long before "passed on." I replaced them in the bottle and left them for 24 hours, when they, too, appeared to have succumbed. They were then put in a pill box with proper label and date, and I was much sur-

prised on opening this ten days later to find two of them alive and kicking. They were for a second time "gassed" for 24 hours, and then put back with their dead companions. Some two or three weeks later I found one of them was still in "status ante bellum," so I gave him a *week's* cyanide treatment, and he never "came to" thereafter. The bottle was in almost daily use until April 1, and killed quickly all other insects placed in it up to that date.

RECENT CANADIAN PUBLICATIONS.

(Continued from Page 392)

PROCEEDINGS OF THE ENTOMOLOGICAL SOCIETY OF BRITISH COLUMBIA.—March, 1916. No. 8. Systematic Series. Victoria, 1918. 30 pp., 3 pls.

This report contains the following papers and addresses:—

Presidential Address: G. O. Day. Pp. 4–6.

On the species of the genus Pero occurring in British Columbia: E. H. Blackmore. Pp. 7–9 Contains remarks on the genus and descriptions of the four species known from British Columbia, with notes on their distribution.

The occurrence of Glutops singularis Burgess in British Culumbia: R. C. Treherne. P. 10. Records the capture of this rare but widely distributed fly at Agassiz, B. C.

An Appreciation: A. F. Winn. Pp. 11–13. Conveys greetings from the Parent Society, with words of appreciation of the work of the B. C. Branch, and a plea for co-operation among the various branches of the Society.

Furthur additions to the list of British Columbia Geometridæ: E. H. Blackmore. Pp. 14–20. An annotated list of 23 species and varieties recorded for the first time from British Columbia, with synonymic notes on some of the forms. Ten species are illustrated from photographs.

Larva Rearing: G. O. Day. Pp. 21–27. Describes methods of collecting and rearing Lepidopterous larvæ; largely quoted from an article by E. Rippon, in *the Entomologist*, 1915.

In Memoriam. Captain R. V. Hardy: R. S. Sherman. Pp. 29–30, with portrait.

PROCEEDINGS OF THE ENTOMOLOGICAL SOCIETY OF BRITISH COLUMBIA.—March, 1917. No. 10. Systematic Series. Victoria, 1918. 31 pp., 4 pls.

The following articles appear in this number:

Presidential Address: E. H. Blackmore. Pp. 4–10.

Notes on the Lepidoptera of the Northern Okanagan: W. D. Downes. Pp. 11–13. Notes on a small collection made by the writer in this district.

Notes on the hibernation of some larvæ and the movement of Boreus on the snow: J. Wm. Cockle. Pp. 14–15. *Boreus californicus* was observed to appear on the surface of the snow shortly after each fall. They come up through the snow, but do so gradually, following up each fall as it occurs, and always keeping as near the surface as the temperature will permit.

Notes on Geometridæ new to British Columbia.—E. H. Blackmore. Pp. 16–20. Six species and eight varieties new to British Columbia are recorded. Illustrated by two plates, the first showing varieties of *Xanthorhoe defensaria*, recently described by Mr. Swett, the second 8 other forms belonging to various genera.

Fossil Insects, with special reference to those of the Tertiary Lake deposits of the Similkameen Valley, B.C.: Alfred E. Cameron. Pp. 21–29. A brief sketch of the general subject of fossil insects, with notes on a collection of 73 specimens, made by Mr. L. M. Lambe, of the Dominion Geological Survey, in the Tertiary Lake deposits of the southern Interior of British Columbia. These were studied by Handlirsch, the eminent authority on fossil insects, and the results published in vol. II of the Contributions to Canadian Palæontology (Geol. Surv. Can., 1910). The collection is believed to be of early Tertiary age on account of the absence of many families not known before Cretaceous times and the presence of a relatively large number of Diptera, particularly of the Bibionid genus Penthetria, which at present is almost restricted to tropical and subtropical regions. A few other forms have a similar significance. The paper also contains a general account of the geological record of insects.

In Memoriam. Tom Wilson: R. C. Treherne. Pp. 30, 31; with portrait.

Report of the Provincial Museum of Natural History for the Year 1917.—Victoria, B.C., 1918. 35 pp.

Entomology. By E. H. Blackmore, (pp. 09 to 0 15, with 2 plates).

This paper contains notes on some of the injurious insects of the season; an account of a collecting trip for the Museum to the Lower Fraser Valley District; a list of 14 species of Odonata, recently identified for the Museum; notes on rarer insects, taken in the Province during 1917; and an annotated list of British Columbian Lepidoptera described during the same year. The paper is illustrated by two plates from photographs, the first showing Noctuidæ, the second Geometridæ.

Economical Sprays and Spraying for 1918. By. L. Cæsar, O. A. College, Guelph. Forty-ninth Annual Report Fruit Growers' Assoc. of Ont., 1917, (1917) pp. 20–25.

Insects and Fungicides. By L. Cæsar, O. A. C., Guelph. 13th Ann. Rep. Vegetable Growers' Assoc. of Ont., 1917 (1918), pp. 29–32.

In these two papers the various insecticides and fungicides on the market during the season of 1918 are discussed, their characteristics and relative merits given and the prices likely to prevail stated. In the first paper the question of the substitution of arsenate of lime for arsenate of lead is considered at some length, and on account of differences of opinion in different localities on this question, the author does not recommend the former as a general substitute for the latter, though he regards it as safer to use on apples just before the blossoms burst.

The Protection of Plants. By Georges Maheux. Bull. No. 42, Dept. Agric. Prov. Quebec. July, 1918. 30 pp. Published in English and French.

A brief and concise summary of methods for the control of injurious insects and plant diseases, illustrated by numerous text figures. The matter is arranged as follows:

I. Insects injurious to all crops. Under this heading the principal types of noxious insects are described, and the general methods of control outlined.

II. Insects injurious to vegetables. The various kinds of

vegetables are taken up in turn, their insect enemies and diseases enumerated and the remedies indicated.

III. Insects injurious to fruit trees. Following directions for the general treatment of the orchard, the different kinds of fruit trees are taken up as in section II.

IV. Insects and diseases injurious to fruit bushes.

V. Insects injurious to cereal crops.

VI. Sprays. The general principles governing the control of chewing, sucking and boring insects are outlined, followed by the descriptions of the composition and preparation of the chief insecticides and fungicides.

From Le Journal d'Agriculture. Vol. 21, 1918:—

Defense de Culture. By Georges Maheux. No. 7, Jan., p. 110.

Insects nuisibles au blé. By Georges Maheux. No. 9, Mars., pp. 144.

Le travail de la Section Entomologique. By Georges Maheux. No. 10, Avril, p. 149.

From Le Naturaliste Canadien. Vol. 44:—

Les Coleopteres du Canada. By J. I. Beaulne. No. 7, Jan., pp. 110–111; No. 8, Feb., pp. 123–128; No. 9, Mars., pp. 159–160; No. 11, Mai, pp. 187–191:

These parts of this useful list, which was begun in vol. 10, No. 1, 1914, complete the Dytiscidæ and Gyrinidæ and include a portion of the Hydrophilidæ. The source of the original description and the distribution by provinces is given for each species.

Une nombreuse posterité. Le puceron de la rudbeckie (Golden Glow aphis) Aphis rudbeckiæ Fish. By P. Fontanel, S. J. No. 8, Feb., pp. 115–123; No. 9, Mars, pp. 142–144; No. 10, Avril, pp. 157–159.

Describes various features of the life cyce of this aphid and makes a number of calculations based on the theoretical rate of reproduction of the species.

Notes concernant l'Hemerocampe marquée de blanc. By J. C. Chapais. No. 11, Mai, pp. 163–166. 4 figs.

A brief description of the life-history and methods of control of the White-marked Tussock Moth.

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